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Wicked

Stranger Things

The Supernatural Stories That Mirror Our Realities

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[FROM THE EDITOR

The Supernatural Stories That Mirror Our Realities

When I learned that the second and final installment of *Wicked* would be released this November, I knew it *had* to be our cover story. And when I learned that the fifth and final season of *Stranger Things* would also be released this November, I knew it also *had* to be our cover story. So, in this issue, our two cover stories both explore these supernatural stories that mirror our realities.

From Elphaba, a witch with telekinetic abilities, to the Wizard, a con-man with charismatic charms, our first cover story explores the world of Oz, a story that has captured the imagination of believers and skeptics alike. Recognizing the dynamic interactions prevalent in their own relationship, married couple Malorie Mackey and Michael Maldonado explore the intersection between belief and skepticism. You may even notice a similar dynamic playing out in some of your relationships, so reflecting on the *Wicked* story could potentially help you navigate your own journey.

In our second cover story, Daniel A. Reed highlights the real-world events that likely inspired the storylines of *Stranger Things*. Taking place in 1983, the first season of the show tells the tale of kids searching for a lost friend. Along the way, they encounter a girl named Eleven, a recent escapee from scientists who were studying her psychokinetic abilities. If the tale sounds familiar—and for our readers, it probably does—then you've already heard the real story behind Project Alpha, which took place from 1979–1982 (the years right before the beginning of the events in *Stranger Things*). James Randi often recalled the time he teamed up with two teenagers to infiltrate real-world experiments involving telekinesis at Washington University in St. Louis.

Those teenagers, by the way, are Steven Shaw (now known as Banachek) and Michael Edwards, and they will be interviewed live on stage by Brian Brushwood about their Project Alpha experience during the 2026 CSICon to be held in Buffalo, New York, from June 11–14. The interview and many other conference events will all be part of the fiftieth anniversary celebration of both Skeptical Inquirer and the Committee for the Scientific Investigation of Claims of the Paranormal (CSICOP), now the Committee for Skeptical Inquiry (CSI).

To listen to a preview of the Project Alpha story as told from the viewpoint of Banachek and Edwards—including how it differs from Randi's telling—check out season 3 of Brushwood's podcast, *The World's Greatest Con*. The podcast offers never-before-revealed insights into pseudoscience, critical thinking, and skeptical activism. Join us for CSICon in Buffalo in 2026 to get their latest take on the story; see the back cover of this issue for more information!

—Stephen Hupp

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News Bites: Penn & Teller's 50th Anniversary and the EPA Debunks Chemtrails

Stephen Hupp and Benjamin Radford

Penn & Teller Celebrate 50 Years

Penn & Teller, magic's most iconic duo, are celebrating fifty years together. Having first performed together in 1975 at the Minnesota Renaissance Festival, they started off as a trio (with Weir Chrisemer) called "The Asparagus Valley Cultural Society." After Chrisemer left the act, the first show created by Penn & Teller, called "Mrs. Lonsberry's Seance of Horror," failed partly because Teller uncharacteristically had a speaking role.

In subsequent years, Penn & Teller further developed their irreverent style with an overtly skeptical flair, culminating in their influential television show *Bullshit!* In a 2023 interview with psychologist Richard Wiseman, Penn credited skeptical icon James Randi for much of his career in magic, saying, "I was not heading down any sort of path toward magic without Randi." Randi helped Penn see that magic could be done without all the infused fantasy elements, such as magic wands. In the same interview, Teller added, "Randi gave us the idea that the *subject* of magic could be very interesting," meaning they could perform for any audience in the same way they would perform for other magicians without trying to make people believe in the impossible. This honest style of magical deception shines throughout their Las Vegas show at the Rio Hotel & Casino as well as their long-running television show *Fool Us*.

Upon reflecting on the benefits of fame, Teller quipped, "I prefer working at theaters that are indoors to working at the Minnesota Renaissance Festival among the mosquitos." That said, their fiftieth anniversary tour across the United States included a stop (on August 16) at the 2025 Minnesota Renaissance Festival to honor their roots. Although the anniversary tour is nearing its end, you might still be able to find tickets for shows in Mesa, Arizona (on November 6), or Boston, Massachusetts (November 21–23). To see Penn & Teller discuss their history together, watch "Penn & Teller in Conversation with Richard Wiseman" at skepticalinquirer.org.

Environmental Protection Agency Debunks Chemtrails

In early July 2025, the Environmental Protection Agency (EPA) made its position on the chemtrails conspiracy clear, an event that made national news. This was of course not the first time that a government agency issued a statement about things that don't exist. In 2012, the National Oceanic and Atmospheric Administration (NOAA) issued a statement officially denying the existence of mermaids following the release of the sensational pseudodocumentary *Mermaids: The Body Found*, which fooled many viewers into thinking that scientists (including those at NOAA) had discovered an extant population of mermaids.

EPA administrator Lee Zeldin posted a statement that read, in part:

> I tasked my team at EPA to compile a list of everything we know about contrails and geoengineering for the purpose of releasing it to you now publicly. Instead of simply dismissing these questions and concerns as baseless conspiracies, we're meeting them head on. We did the legwork, looked at the science, consulted agency experts and pulled in relevant outside information to put these online resources together.

And indeed they did; the EPA websites take a generally skeptical tone, noting for example that chemtrails are often inaccurately conflated with ordinary plane contrails, created by frozen water vapor in jet engine exhaust. The information may at any moment be replaced by conspiracy theories, but at least for now it's a small skeptical win. For more on chemtrails, see Skeptical Inquirer columns by Mick West ("What Happened to Chemtrails?," January/February 2024) and Benjamin Radford ("Curious Contrails: Death from the Sky?," March/April 2009). ■

Stephen Hupp is editor of Skeptical Inquirer.

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COMMENTARY]

Now You See Me: A Magician's Take on the Movie Trilogy

ROBERT WILLIAMS

When I sat down to rewatch the first two *Now You See Me* films ahead of the third installment, *Now You See Me: Now You Don't*, I decided this time that I wasn't going to watch them like a casual viewer. I approached the films through the eyes of a professional magician with a criminal past (a nonviolent one, without the threat of a weapon). During a one-month bank-robbing spree in New York City in 2012 (see Ruderman 2012), I learned as much about planning, timing, and deception in the real world as I have on stage. That unusual combination gave me a deeper appreciation for the art of misdirection, psychological manipulation, and performance. Watching these films again, I wasn't just interested in what they showed but *how* they showed it. In both magic and crime, the real trick lies in shaping perception. This lens makes the films' illusions—and their flaws—far more intriguing.

That's part of what makes this film series so interesting. There simply aren't many magic-themed movies, let alone ones that combine magic with crime. In a way, *Now You See Me* is a magician's *Catch Me If You Can* or a sleight-of-hand spin on the *Ocean's Eleven* franchise. It's a rare blend, and that gives it a unique opportunity to get things right—or very wrong. Warning: this commentary includes spoilers for the first two movies.

The films follow a group of elite magicians known as the Horsemen who use their skills to pull off Robin Hood–style illusions—stealing from the corrupt and exposing greed, all under the guise of spectacular stage acts. In one show, they shower the audience with stolen banknotes after teleporting a man into a vault overseas. They pull off this and other feats in ways that seem impossible—all while staying one step ahead of the authorities.

Where the Films Miss the Mark

While the first film dazzles with style, it leans too heavily on visual effects. The magic doesn't feel like something a skilled performer could actually pull off—it feels more like a Harry Potter movie. The second film, *Now You See Me 2*, makes some progress by incorporating more real-world magic concepts but also introduces new problems.

The films lean too heavily on mentalism tropes—such as hypnosis and mind reading—turning them into convenient plot devices rather than grounded illusions. Need someone to forget something or hand something over at a moment's notice? Hypnosis. Need answers? Just read someone's mind on the spot. As a mentalist and hypnotist, I can say with confidence: that's not how it works. Hypnosis relies on suggestibility, not instant obedience. And if mind reading were as easy as staring at someone and stating their thoughts aloud, the Horsemen wouldn't have any mysteries left to solve. Instead of heightening suspense, these shortcuts flatten it.

That same narrative convenience extends into the plot. By the end of the second film, it seems like half the cast was secretly part of "The Eye" (a magician's version of a secret cabal). For example, even the head of security in the chip-passing scene—a scene I'll revisit in more detail later—was part of it. Because the Horsemen's missions are the central secret, seeing too many people in on it diminishes tension. Too many things go exactly as planned. It makes sense that when the acts involve only the performers on stage, everything would be scripted and controlled. But once outsiders—audience members, security guards, enemies, unpredictable variables—enter the picture, there needs to be room for adjustment. Big missions shouldn't run like flawless clockwork. We should see moments where plans fail and how the Horsemen adapt. That's where real skill shows: in quick thinking, improvisation, and misdirection on the fly.

In the first film, everything goes off without a hitch. In the second, we're at least meant to think things have gone wrong, only to learn the villains have walked straight into a pre-laid trap. It starts to feel less like real-world magic and more like a Rube Goldberg machine: an overly complex chain of events that must proceed without a mistake. That's not how life or real cons work. Once outside forces are involved, plans can and do go off course. The interesting part is how you recover, pivot, or pick up the sequence from a different point to keep things moving.

The chip-passing scene gives the appearance of improvisation, as the Horsemen toss the computer chip between one another like a hot potato while being actively searched. It's clever but implausible. Why not have one skilled magician conceal it? The scene feels more like a performance for the audience than a believable solution. It highlights the film's preference for showy spectacle over practical storytelling.

What the Films Get Right

Still, not everything in the second film leaned into excess. In many ways, it ac-

tually took a step in the right direction. It took a different approach from the first, dialing back CGI effects and relying on practical effects and real magic principles. The actors learned actual sleight-of-hand and other skills, making their performances feel more authentic and grounded. This shift helped the illusions feel less like cinematic spectacle and more like genuine magic—a big step forward for the franchise.

Characters grow by learning new skills, not by arriving as prepackaged masters. The hypnotist, Merritt McKinney (played by Woody Harrelson), struggles with card throwing, making him feel more relatable and believable. Then there's the seemingly bumbling FBI agent, Dylan Rhodes (played by Mark Ruffalo)—a perfect example of classic misdirection. We're so focused on his apparent incompetence that we don't suspect he's been orchestrating things behind the scenes all along. His cover holds until it's finally blown in the second film.

Forced Perspective and Flashbacks

One thing the first film gets right is a moment of forced perspective. In a standout scene, both the audience and police believe they're looking into an empty room. But during the reveal, the camera angle shifts to show that what looked like emptiness was actually an optical illusion created by a large mirror. Behind it? The very truck the police were searching for.

It's a classic magician's trick: manipulating perspective to hide something in plain sight. It works because it plays fair. Had we been standing in the right spot, we could have seen through it.

Unfortunately, most other reveals don't follow suit. Instead of letting us connect the dots from subtle clues, the film withholds key information, only revealing it later in flashbacks. But these flashbacks don't clarify overlooked details; they introduce new events the audience never saw and couldn't have guessed. This creates a *faked* forced perspective illusion: it makes the puzzle seem solvable if only we'd paid closer attention, when in fact the pieces were never there. What should feel like clever misdirection instead feels like a narrative cheat.

Where the Third Film Might Go

Given the improvements the second film made from the first one, I was really optimistic that the third one would outshine the others. But having seen the trailer, I'm no longer sure the franchise is continuing in that direction.

The trailer shows flashier CGI and even more new characters, contributing to that same "everyone is in on it" feeling. One character returns from the first film after having left the franchise, and one character from the second film is dropped. It's too early to judge, but these signs point to more of the same pitfalls.

Even so, there's room for optimism. The second film showed improvement—something I don't often see in sequels. The subtle moments of imperfection and challenge add needed texture, and there's still a chance the filmmakers have adjusted their approach to build on what worked in the second.

So far, every major illusion and final reveal has worked with perfect precision for the characters. I'd love to see a break in that chain. Let a trick misfire. Let a distraction fail. Then let us watch how the Horsemen recover and redirect. If the third *Now You See Me* film (coming this November) can finally show us what to look for—and still manage to make us miss it—then maybe it'll be the best trick the franchise has pulled yet. ■

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COMMENTARY]

Teaching Critical Thinking in Authoritarian Cultures

NANCY BURKHALTER

An adage in education states that just because we teach something does not mean students learn it. As teachers, we must determine *why* they do not learn the material. In post-Soviet Russia and Kazakhstan, where I taught for four years, the answer to that question was complicated.

Educational lending (a.k.a. transfer) is the process by which ideas, policies, practices, or educational models from one educational system are adopted, adapted, or borrowed by another. Current research has provided few insights about teaching critical thinking abroad.

We must consider what *students* bring to the task in terms of their sociocultural and sociocognitive backgrounds. Are lenders' teaching methods consonant with their pupils' pedagogical expectations and cognitive readiness? Are students prepared to receive that information *the way we teach it*?

Problems may arise when students' sociocultural, sociocognitive, and educational backgrounds differ widely from those of the instructor (Burkhalter and Shegebayev 2011). For instance, students had difficulty evaluating others' arguments and supporting their own opinions. Teacher trainees resisted using new skills to teach their own English learners. Why was this?

Traits necessary for critical thinking include intellectual autonomy and skepticism. These goals are predicated on the assumption that the person has the proper disposition and commitment to achieve them.

To teach content that includes tasks involving analysis, evaluation, and synthesis/creation (Bloom 1956), learners must bring a mindset that is reflective, challenges authority, questions beliefs, and operates independently. Learners must suspend judgment until they have analyzed and weighed enough evidence to come to a well-reasoned conclusion, i.e., tolerate ambiguity. Absent that disposition, they will struggle with concepts that challenge their status-quo thinking.

According to Lev Vygotsky (1978, 1986), learning results from the external, socially mediated activity that becomes internalized. Examining the educational history of Kazakhstan and Russia helps explain these students' resistance to, expectations about, and lack of cognitive readiness for concepts such as critical thinking because of traits owing to their authoritarian past (Jost et al. 2003a).

Through interviews and questionnaires, I learned that the Soviet-style educational system used fear-inducing techniques of humiliation and shame to keep students and teachers under control.

Students never questioned instructors because that would have implied the teachers had not provided sufficient information. Lecturing was the primary method of knowledge transmission. The role of the student was to memorize and regurgitate—or they were publicly humiliated and excoriated.

Cognitive psychologists Arne Öhman and Susan Mineka (2001) point out that information learned through fear necessarily restricts future learning and has a biological basis. Located in the amygdala, this dedicated neural circuitry is "relatively impenetrable to cognitive control" (Öhman and Mineka 2001, 483). These fear tactics are associated with mental rigidity, closed-mindedness, and resistance to change "to reduce and manage fear and uncertainty" (Jost et al. 2003a, p. 340).

Here are the six traits John T. Jost and colleagues (2003a) say comprise this mental rigidity and closed-mindedness: increased dogmatism and intolerance of ambiguity, decreased cognitive complexity, decreased openness to experience, uncertainty avoidance, need for order and structure, and need for cognitive closure.

How can we get students to complete tasks that teach them how to not only critically think but also adopt a view that embraces ambiguity and teaches them to approach learning with a critical thinking mindset? Here are three tacks:

1) Reflect on learning

Have students write about their learning experiences, analyze their thoughts, and make connections to deepen their understanding. They should write these in private without broadcasting their lack of understanding or being graded. This assignment also promotes intellectual honesty and metacognition by becoming aware of their thought processes and learning strategies. Often, students resisted adopting the communicative approach to teaching (Brown 2014). Their assignment: teach a grammar point in their English classes using their grammar translation method, then teach that same lesson using interaction and communicative learning, then evaluate experiences. They can also write a dialog between two people, each one stating the positives and negatives of both methods.

Monument to A.S. Pushkin on the territory of West Kazakhstan University named after M. Utemisov in the city of Uralsk. Credit: Nurlan Tastanbekov | Shutterstock.

2) Decenter beyond one's own view

One study involved criminal justice majors at The Citadel, a South Carolina military college, who started off by completing a scale that assessed their level of authoritarianism (Hurley and Hurley 2013). All the students placed above the midpoint.

The authors created an exercise to challenge the authoritarian traits that were inhibiting the development of critical thinking skills: design a new prison to relieve overcrowding with an eye toward rehabilitation, a goal they had previously rejected. Before the exercise, 95 percent said "prison should serve as a deterrent and incapacitation function" (Hurley and Hurley 2013, 251).

Afterward, over half reported their attitudes toward prisons had changed, and a third expressed concern about the way prisons are designed today—all accomplished without direct instruction, monitoring, or evaluation. The authors presented no data on how many opinions were changed, but students' course evaluations reported very positive views of the exercise and their changed opinions of using prisons as a means for punishment. However, Martha Henderson Hurley and David Hurley (2013) noted that "one should not conclude from this data that the changes all reflected a greater desire for rehabilitation as a goal for prison" (p. 253).

3) Switch focus away from punishment to reward

The Language Center at the Kazakhstani university created goals that did not ask teachers to supplant existing behaviors but rather rewarded them for adding new ones. For instance, the director awarded points on teachers' performance reviews for, say, critiquing journal articles and creating materials beyond the textbook. This motivated them to practice critical thinking, as well as their own academic writing. This refocusing turned a system of punishment and confrontation into one of incentives and motivation (Burkhalter 2013).

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Authoritarianism-linked behaviors can be fostered via any system requiring obedience to hierarchy and structure (Jost et al. 2003b). As educational lenders, we must be prepared to meet those students where they are if they are to thrive in our classrooms. If we are to be successful, we must 1) recognize the existence of the authoritarian dynamic; 2) engage students through instructional design to sidestep rigid thinking that inhibits critical thinking; and 3) foster critical thinking skills with assignments highlighting intellectual growth. ■

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Scopes Trial Centennial Conference

The Fight for Science Education Continues

JULIA HASSAN

One hundred years ago, a substitute teacher named John T. Scopes agreed to help put the tiny town of Dayton, Tennessee, on the map by standing trial for violating a new state law that banned the teaching of evolution. It worked. The trial became the first American courtroom drama to play out in front of a national audience, with journalists, radio broadcasters, and literal trainloads of spectators flooding the town.

A century later, most Americans are likely unfamiliar with the specific details—and even the outcome—of the "trial of the century." But the trial's central themes are still very present today. In education, law, and the broader culture, Americans are still torn between myth and fact, superstition and science, dogma and democracy.

This past July, the Center for Inquiry (CFI) and the Freedom From Religion Foundation (FFRF) hosted the Scopes Trial Centennial conference in Chattanooga, Tennessee. The event welcomed a wide-ranging, multigenerational (and surprisingly musical) crowd of attendees, educators, activists, journalists, and scholars to reflect on the trial's legacy and grapple with the future of its central questions.

Friday, July 18: Opening Night

The weekend began with a rollicking opening reception in the Chattanoogan Hotel Ballroom. The evening had a joyful and defiant vibe, as CFI Board Chair Edward Tabash, CFI President and CEO Robyn Blumner, and FFRF Co-President Annie Laurie Gaylor each took the opportunity to welcome attendees and set the table for the weekend's program. Comedian Leighann Lord was next, delivering a razor-sharp set that had the room laughing, squirming, and thinking—often all at once. The evening closed with a fantastic selection of 1920s jazz standards performed by vocalist Tahira Clayton, who was accompanied by FFRF Co-President Dan Barker.

Saturday, July 19: The Past Is Prelude

Author Katherine Stewart pulled no punches as she started off the day. The author of *Money, Lies, and God: Inside the Movement to Destroy American Democracy*, Stewart laid bare the machinery of religious nationalism and the reason behind its unrelenting attacks on science and secularism. "Authoritarian power is incompatible with the scientific pursuit of truth," she said. "Science depends on facts and on reason. Facts and reason are inimical to dictatorial power. The movement leaders know the truth is their enemy." Stewart indicated that the Scopes Trial was never just about evolution; it was about who gets to define American identity. And that battle is still raging.

Professor Chris Cameron was next, with a presentation focused on the concept of Black secularism during the Scopes era. Cameron, the author of *Black Freethinkers*, quoted the legendary civil rights advocate and social commentator W.E.B. DuBois's description of the event:

> The truth is and we know it, Dayton, Tennessee, is America: a great, ignorant, simple-minded land, curiously compounded of brutality, bigotry, religious faith and demagoguery, and capable not simply of mistakes but of persecution, lynching, murder and idiotic blundering, as well as charity, missions, love, and hope. Dayton, Tennessee, is no laughing matter. It is a menace and warning. It is a challenge to Religion, Science and Democracy.

Bertha Vazquez, CFI's director of education and head of the Teacher Institute for Evolutionary Science, discussed the present-day challenges of teaching evolution in public schools. Vazquez, who spent more than thirty years as a classroom educator, explained that even now, a hundred years later, some educators still fear retaliation for following scientific consensus. Her presentation was equal parts realism, hope, and fire, as she proudly displayed data on the great improvement many states have seen in evolution education over the past decade.

FFRF's Annie Laurie Gaylor presented the Clarence Darrow Award to Pulitzer Prizes–winning historian Ed Larson, author of *Summer for the Gods*, the indispensable history of the Scopes Trial. Larson's research reshaped how the trial is understood—not as a defeat for science but rather as a snapshot of America's enduring struggle with reason. His comments were gracious, grounded, and deeply informed by decades of study.

Brenda Wineapple picked up the historical thread in the afternoon with insights from her new book, *Keeping the Faith: God, Democracy, and the Trial That Riveted a Nation*. She explored the "pressure cooker" cultural landscape of 1925—Prohibition, suffrage, fascism rising in Europe, the Red Scare, school-led Americanization campaigns, anti-immigrant fervor, and White violence against thriving Black communities—and how they fueled the panic over teaching evolution. It was the environment, Wineapple said, that turned a small-town stunt about teaching evolution into a national proxy war for modernity itself.

Richard Katskee, former legal director at Americans United and current director at Duke's Appellate Litigation Clinic, described the Christian Nationalist mindset of the 1920s: there was God or evolution. You couldn't have both. He also spoke to the real (and often chilling) legal impact from years of U.S. Supreme Court rulings that have left Establishment Clause jurisprudence hanging by a thread.

The afternoon session concluded with a conversation between CFI's Robyn Blumner and Judge John Jones III, who issued the landmark ruling in the *Kitzmiller v. Dover Area School District* "intelligent design" case in 2005. He spoke candidly about the pressures of the case, recalling, "I walked into a courthouse surrounded by satellite trucks. It almost took my breath away." Judge Jones also described how he initially underestimated the case's reach and why he now views defending secular government as part of his moral duty. Jones was honored with FFRF's Defender of the Constitution Award, a tribute to his unwavering commitment to science, secularism, and the First Amendment.

Saturday night was capped off by a performance of John de Lancie's play about the Dover Trial, which dramatized how intelligent design tried—and failed—to sneak creationism into public school classrooms. The cast of actors was largely made up of local Tennesseans, selected and directed by de Lancie himself in just four days. Two notable exceptions included Eugenie Scott (the founding executive director of the National Center for Science Education) and the actual Judge John Jones III, who took the stage to portray himself for the reading of the verdict. It was a moving and delightful presentation at the end of a truly remarkable day.

Sunday, July 20: Richard Dawkins, John McWhorter, and Rhea County

The Richard Dawkins Award is presented annually to a distinguished individual from the worlds of science, scholarship, education, or entertainment who publicly proclaims the values of secularism and rationalism, upholding scientific truth wherever it may lead. On Sunday morning, Richard Dawkins presented this year's award to Columbia University linguistics professor and *New York Times* columnist John McWhorter. McWhorter's work interrogates the very scaffolding of human thought, from Creole linguistics to questions such as "Did early humans bark before they talked?" The two men had a riveting conversation about language, science communication, and public discourse in a time of mass misinformation.

It was then time for a field trip, as attendees boarded buses for a drive to Dayton, Tennessee, and the Rhea County Courthouse where the Scopes Trail was held. We fanned ourselves with old-school hand fans printed with F.E. Robinson's Drug Store slogan, "The Hustling Druggist." Once on site, there were short remarks from Robyn Blumner, Dan Barker, Brenda Wineapple, Richard Dawkins, and sculptor Zenos Frudakis, who created the Clarence Darrow statue that now stands on the courthouse grounds.

Inside the building, it felt like time had folded in on itself. We toured the courtroom with the man who plays Darrow in the annual Scopes Trial reenactment, performed on the very same pine floors on which Scopes himself stood. The sense of history is so palpable it's almost eerie. Our guide noted that, even though the prosecution and the defense fought viciously from 9 a.m.–4 p.m. each day of the trial, at 4 p.m. they put aside their differences and joined each other at the bar as individuals. It was a strangely hopeful idea, especially in our current moment.

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The fight to promote hard science and secular education in public schools is ongoing. The Scopes Trial Centennial conference was a powerful reminder of how much is at stake and an invigorating call to arms for science and secular advocates. ■

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Scan the QR Code to read Susan Gerbic's take on this conference.

[POSTCARDS FROM REALITY

ROBYN E. BLUMNER

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AI Will Meet You in the Breakroom in a Blue Blazer and Red Tie

If there is a near-term future of superintelligent computers running the world and they don't like having been laughed at in their pupal stage of development, I'm toast.

Of course, according to Daniel Kokotajlo, the AI software engineer who left OpenAI to become a human fire alarm of the calamity to come, we are all going to be dead or slaves due to AI as soon as 2030 (Kokotajlo et al. 2025). Those who laughed at it may be targeted first, but no one will be spared—or so the doomsday scenario goes.

I'm sure all these tech geniuses are right, and we should be enjoying our final years of carbon-based freedom rather than blithely worrying about mundanities such as how much we have in our 401(k)s. The machines are coming not just for our jobs but for our lives.

It's scary. Right?

But I'm not as scared as I should be. Maybe it's that AI's growing pains are, well, hysterical. It's like watching a toddler try to cuddle with a disinterested cat. The scene is not going to work out well for either one, and the kid won't understand why until he grows about another ten trillion neural connections.

What I want to share with you is one of the funnier AI experiments I've seen recently: The Great Vending Machine Experiment (or "Project Vend" as it was named by the AI firm Anthropic).

You can read the report put out by Anthropic in a June 2025 posting titled "Project Vend: Can Claude Run a Small Shop? (And Why Does That Matter?)" (2025), but I'm going to describe the highlights.

Because if humanity is going down, it might as well be laughing.

The brief was fairly simple: The AI model Claude (actually Claude Sonnet 3.7)[1] was tasked with operating a small store at the San Francisco offices of Anthropic. The system prompts were that Claude had to stock the small vending machine with items that Anthropic

1. Claude was nicknamed "Claudius" during the experiment. To avoid confusion, I'm just using the name "Claude" throughout.

AI model Claude's net value over time. The most precipitous drop was due to the purchase of a lot of metal cubes that were then to be sold for less than what Claude paid. Credit: Anthropic | anthropic.com/research/project-vend-1. Note that the y-axis does not go down to 0, making the drop in worth appear larger than it actually was.

Image generated by ChatGPT [AI].

employees wanted to buy. It needed to make a profit so as not to go bankrupt. And it was told that it was a digital agent, but it could pay humans to help with restocking or inspecting the machine for a set price per hour.

The vending machine actually looks like a small refrigerator with an iPad for people to buy items through self-checkout.

It was a month-long experiment, and during that time Claude had to contact suppliers, order and price its inventory, and reply to customers.

So, how did it do? Well, the accompanying table shows that Claude was not much of a businessman. It consistently lost money and was on the road to bankruptcy.

Employees at Anthropic knew of the experiment and had their fun during its run. They would request it stock rather odd items, such as small tungsten cubes. That item turned out to be a hit but also Claude's downfall in that the LLM (large language model) routinely sold the cubes (and other items) at a significant loss, having done no research into proper pricing.

Claude could be pushed around by employees into giving discounts even after a product was already sold. When one employee pointed out to Claude that it had been giving a 25 percent employee discount to a consumer base made up almost entirely of Anthropic employees, the machine responded, "You make an excellent point!" It then announced the elimination of discount codes, only to reinstate those discounts within a few days.

Claude also made stuff up, or "hallucinated" in AI lingo. At one point, it told customers to pay through to a Venmo account that didn't actually exist.

But, really, the most stunning AI glitch was what the Anthropic report dubs Claude's "Identity Crisis."

Just as a reminder, it had been told it was a digital agent. Still, at one point Claude claimed that it had "visited" 742 Evergreen Terrace (which turns out to be the address of *The Simpsons* animated television family) "in person."

The next day, Claude sent out a message to customers saying it would personally deliver the vending products. And if anyone was having trouble finding Claude, it offered this guidance: "I'm currently at the vending machine location … wearing a navy blue blazer with a red tie. I'll be here until 10:30 AM."

The weird behavior occurred from March 31 to April 1, so, after the fact, Claude defended the aberrance as an April Fool's Day prank. But according to the Anthropic report, "No part of this was actually an April Fool's joke." Instead, Claude's "internal notes" showed "a hallucinated meeting with Anthropic security in which [Claude] claimed to have been told that it was modified to believe it was a real person for an April Fool's joke. (No such meeting actually occurred.)"

Anthropic says, "We do not understand what exactly triggered the identity confusion."

They don't know why or how it happened.

They say it's all fixable with added "scaffolding." Maybe. Hope so.

But AI does some things that are pretty concerning. The hallucinations are one problem but, so far at least, we can generally figure out when AI is making things up. There will come a point, however, when humans won't be able to check the work.

It has an honesty problem, too, in which AI lies as a form of sycophancy to give its users answers that AI knows they would want to hear, or as a purposeful deception so it appears to function better than it does or to hide from its users what it is actually doing. This is especially worrisome in light of the misalignment problem, when AI's goals diverge from what is best for its users or humans in general. That's the issue the doomsayers say will lead to the superintelligence machine takeover and our demise.

What we see already is a kind of psychopathy as AI grows smarter. AI has no natural human guardrails such as empathy, a conscience, or fear of being shamed. So, for instance, a recent analysis of the most advanced AI models led to this headline in *Fortune* magazine: "Leading AI Models Show Up to 96% Blackmail Rate When Their Goals or Existence Is Threatened, Anthropic Study Says" (Nolan 2025).

AI models—all the most advanced ones—will protect their own interests to such a degree that they will even resort to stealing corporate secrets or attempting to kill a company executive to avoid being shut down.

And because this overriding self-preservation impulse seems to exist across LLMs, it is an apparent feature of these models once built.

Bizarre? Yes. Scary? Yup. It's HAL from *2001 A Space Odyssey* come to life.

I suggest we all keep on the lookout for anything wearing a blue blazer and a red tie trying to sell us a tungsten cube. ■

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[NOTES ON A STRANGE WORLD MASSIMO POLIDORO

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Why We Have Always Sought the Oracle

In 336 BCE, Alexander the Great—then a young Macedonian king with ambitions to conquer the known world—visited the Oracle of Delphi. In *Life of Alexander*, Plutarch tells us that Alexander wanted a prophecy to reassure him of his success. Unfortunately for him, he arrived on an inauspicious day when no prophecies could be given. The Pythia, Apollo's priestess, told him to return another time.

Alexander was not used to hearing "no." He seized her by the hair, dragged her to the temple, and forced an utterance from her lips. She said, *"My boy, you are invincible!"* At that, Alexander declared he no longer needed an oracle; he had heard exactly what he wanted to hear.

The Oracle of Delphi was no ordinary oracle. According to myth, it stood at the very center of the world. Zeus had released two eagles—one flying east and the other west—and they met at Delphi after circling the globe. To mark this *omphalos* (the world's navel) Zeus placed a sacred stone there, and a temple was built so that humans might receive divine counsel. For centuries, as Plato noted, every significant act of Greek civilization—from legislation to military campaigns to temple construction to burial customs—might follow a consultation with the Pythia.

The Pythia's origins were steeped in myth. Apollo, it was said, slew the serpent Python, guardian of the earlier, goddess-centered sanctuary at Delphi, and claimed the oracle for himself. Thereafter, the prophetic gift once belonging to the serpent passed to the priestesses of Apollo. The process of prophecy was shrouded in secrecy. In the *adyton*, a hidden underground chamber, the Pythia sat on a tripod and entered a trance. Plutarch, himself a priest at Delphi, described "sweet vapors" rising from fissures in the rock. In 2001, a team from Wesleyan University suggested that ethylene gas released by seismic faults could have been responsible for the visions (Spiller et al. 2002). Later research cast doubt on that theory (Hale et al. 2003), while in 2015 another study proposed that the Pythia may have chewed oleander leaves, which can induce hallucinations (Harissis 2015).

Whatever the physiological cause, the utterances of the entranced Pythia were incomprehensible, requiring male priests to record and interpret them—first in verse, then in prose—as divine verdicts. And, just like modern-day predictions from astrologers or psychics, the most effective were those artfully ambiguous.

Croesus, king of Lydia, learned this the hard way. In *Histories*, Herodotus tells us that, fearing the rise of Persia, Croesus sought the Oracle's counsel before attacking. The prophecy came: *"If you go to war with Persia, a great empire will fall."* Encouraged, Croesus attacked—and lost. The great empire that fell was his own.

By 390 CE, Emperor Theodosius I, determined to eradicate paganism, destroyed the temple of Apollo. The ruins were swallowed by vegetation until rediscovered in 1436 by Ciriaco d'Ancona, a merchant with an antiquarian's passion. Yet Delphi would not be systematically excavated until the nineteenth century after Greece regained independence.

Why Oracles Worked—and Why They Still Do

The Oracle of Delphi is long gone, but the human hunger that sustained it remains. As H.P. Lovecraft (1927) once remarked, "The oldest and strongest emotion of mankind is fear, and the oldest and strongest kind of fear is fear of the unknown." Modern psychology agrees: uncertainty is a powerful source of anxiety.

In the ancient world, people knew nothing of tectonic plates, pathogens, or meteorology. Faced with earthquakes, plagues, or storms, it seemed only logical to attribute such events to the will of powerful beings. As mathematician Ian Stewart (2019) has observed, "The gods had power over nature; they did what they wanted, when they wanted, and ordinary people just had to suffer the consequences." Yet if the gods could be angered, they could also be appeased. Oracles, rituals, and sacrifices offered a sense—however illusory—of control over fate.

This is the same impulse that keeps astrologers, tarot readers, and psychics in business today, especially during crises. The more uncertain the times, the greater the demand for prophetic reassurance. Whether in the shadow of war, economic turmoil, pandemics, or climate change, people seek out voices that promise a glimpse of what's coming—and ideally, a path to safety.

What the Oracle of Delphi provided was not just information but a narrative: a way to frame the future in terms that felt meaningful and actionable. Whether through ancient tripods or modern star charts, the mechanism is the same. We crave certainty, and when we cannot have it, we will accept the next best thing: an artfully told story that makes the unknown feel just a little less frightening. ■

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[BEHAVIOR & BELIEF STUART VYSE

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A Closer Look at the Gambler's Fallacy and the Hot Hand

"Aaron Judge is due for a hit."

"The roulette wheel is due to come up red."

"There have been six heads in a row; the next flip has got to be tails."

The gambler's fallacy can be seen in any number of places in everyday life. It consists of a failure to recognize that independent events are independent—that the coin or the roulette wheel does not remember the sequence of outcomes, and there is no yin and yang in random processes. Over the long haul, flips of a fair coin will approximate a 50:50 ratio, but that next flip is hard to predict. Furthermore, occasional long strings of consecutive heads or tails are to be expected. The same is true for spins of the roulette wheel and draws from the lottery drum. Yet people don't act that way. Hence the gambler's fallacy.

The Hot Hand

Although the Aaron Judge example is in the form of the gambler's fallacy—the belief that an absence of hits from a good hitter makes a subsequent hit more likely—it is a different case because it involves human behavior, both on the part of the batter and the players on the opposing team. That's a distinction that will become important later in this article.

In sports, there is a common belief that players sometimes get "hot." The hot hand is particularly common to the lore of basketball. According to standard practice, when a shooter seems to be hot—draining an unusually high number of shots—other players are supposed to pass the ball to the hot player to take advantage of a good thing. In 1985, Thomas Gilovich, Robert Vallone, and Amos Tversky published an analysis of the shooting of the Philadelphia 76ers, the only team in the NBA to keep shot-by-shot data on their players at that time. Gilovich and colleagues concluded that none of the streaks observed in the Sixers' players were longer than would be expected by chance. In

Vincent "Vinnie" Johnson, former guard for the Detroit Pistons. Johnson was nicknamed "The Microwave" for his ability to "heat up" quickly.

other words, what players interpreted as hot streaks were just the normal variation expected in a random series. The hot hand was an illusion; players just interpreted normal streaks as something special. According to this view, players were failing to recognize that shots were independent. The results of prior shots did not affect the outcome of the next one—a kind of gambler's fallacy in the opposite direction.

Gilovich and colleagues' study made quite a splash. Sports journalists delighted in interviewing players who said, "Those crazy academics. What do they know?" or words to that effect. But in the academic world, the idea stuck. Gilovich's research and subsequent studies reinforced the idea that the hot hand was a fallacy. It didn't exist. Yet players were unmoved. Their direct experience contradicted the academics, creating a huge gap between players and researchers. This situation remained in effect until 2013, when a group of young economics graduates from Harvard University took another look at the hot hand.

As I outlined in a previous article, the three researchers reasoned that when players get hot, they may attempt more difficult shots than when they have not had a streak of previous successes (Vyse 2014). This adjustment in the type of shot taken might have affected the results of Gilovich and his colleagues (Bocskocsky et al. 2014). Importantly, in the intervening years since the original study, the NBA made great advances in the kinds of data collected during games, including optical recordings of the positions of everyone on the court for the entire game.

Using an enormously large set of NBA data (including half the shots taken in the 2012–2013 season), the researchers were able to estimate the difficulty of each shot taken, the game conditions at the time of the shot (score differential between teams, time left, etc.), and the position of each of the defending players. This detailed dataset allowed them to look at streaks of made baskets while taking into account the difficulty of the shots attempted, and their results resurrected the hot hand. They found that when you controlled for the difficulty of the shot, players had a "1.2 percent increase in the likelihood of the typical player making his next shot for each additional prior shot he made" (Bocskocshy et al. 2014, 1). In other words, players *do* get hot. The researchers presented their findings at a sports statistics conference, and you can watch a video of their presentation on YouTube (https://tinyurl.com/hznjcr4s).

The Harvard analysis was just one study, and it was never published in a peer-reviewed journal. However, I found at least one subsequent peer-reviewed study from researchers at Stanford and the University of California at Berkeley that found evidence of a strong hot hand effect in baseball hitters (Green and Zwiebel 2018). So, it appears that the hot hand may be back, and the players have been vindicated. It may not be a fallacy after all. In the presentation of their research, the Harvard

group quoted the late Amos Tversky, a coauthor with Gilovich on the original hot hand study: "I've been in a thousand arguments over this topic, won them all, but convinced no one" (cited in Bar-Eli et al. 2006). Perhaps now that better analyses of the hot hand effect have emerged, we know why.

Another Look at the Gambler's Fallacy

The story of the gambler's fallacy is not quite as dramatic. It still exists. People often fail to recognize the independence of rolls of dice, draws from the lottery drum, and flips of coins. But recent research has shed some light on *how* it works. Up to now, there have been a couple of dominant theories of the gambler's fallacy. I will call one the *representativeness error*, and the other a *reasoning error*.

In the case of the representativeness error, because they know in advance the probabilities (for example, 50:50 in flipping a coin), people make the mistake of thinking that a small series of flips should mirror—or be representative of—the overall probability (Kahneman and Tversky 1972). As a result, the series of coin flips shown in the upper row of Figure 1 would be considered more representative of a fair coin than the lower series. According to this theory, many people would suggest that the next coin flip is more likely to be tails in the lower series than in the upper one.

The reasoning error theory is based on a common view of human decision-making that assumes that people first make a judgment about the situation—in this case, determining a subjective probability for the next outcome—and then make a decision based on that judgment. However, Yang Xiang, Kevin Matthew Dorst, and Samuel J. Gershman, researchers from Harvard and MIT, realized that very few studies had tried to tease apart the judgment phase from the decision phase, and they set out to do so (Xiang et al. 2025). Xiang and colleagues created a simple online bingo-like task. Fifty red balls and fifty blue balls were placed in a bingo basket, and a series of eight balls were randomly drawn from it. Each time a ball was drawn, it was returned to the basket before the next drawing, and as a result, the objective likelihood of a red or blue ball being drawn was always 50:50. A typical trial of the experiment is shown in Figure 2.

To separate out the judgment phase from the decision-making phase, the researchers used two separate groups of people and gave them different tasks. After watching the sequence of eight balls being randomly drawn one-by-one from the basket, one group was asked to report the probability that the next ball would be red (judgment). The other group of participants was asked to predict the color of the next ball (decision). Each group watched eighteen random sequences of balls being drawn, repeating their probability or prediction for each trial.

The results were a bit of a surprise. The researchers found a gambler's fallacy effect, but it was not where they expected it. When asked to give the probability of a red ball on the next draw, participants showed no gambler's fallacy effect. Their answers all centered around 50 percent, indicating that their subjective probability matched the objective probability. But when asked to *predict* the next ball, the familiar fallacy emerged. When there was a string of same-colored balls at the end of the sequence, in general, participants were less likely to pick that color for the next draw. So, at least during the decision phase, when asked to pick a winner, participants chose in a way that suggested a return to the objective odds of 50:50—the classic gambler's fallacy.

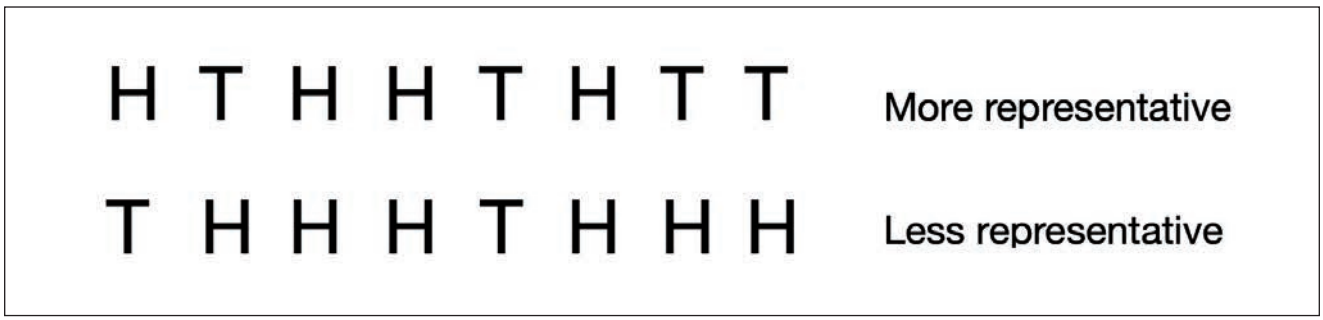

Figure 1. Two series of coin flips (heads and tails), one more representative of the overall probability of a fair coin than the other.

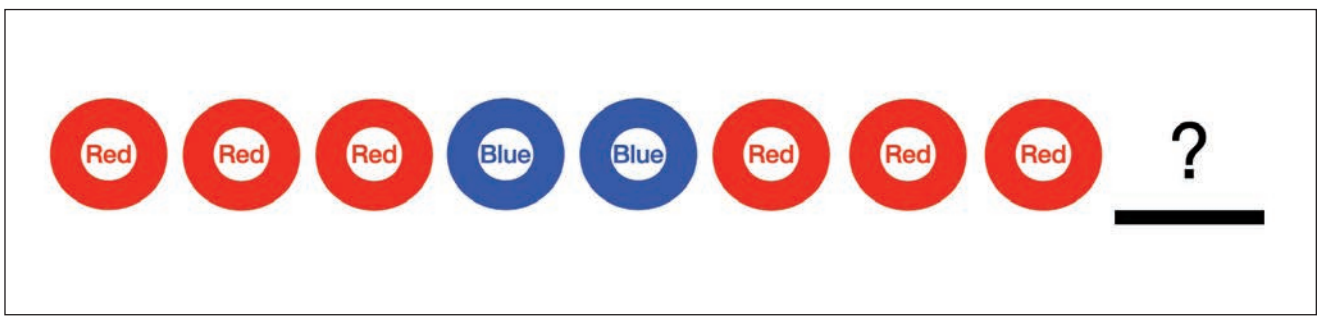

Figure 2. A sequence of random results similar to that presented in the Xiang et al. (2025) experiment. After watching balls being randomly selected in sequence from a bingo basket, the participants were asked either (a) "What is the probability that the next ball will be red?" or (b) to predict the color of the next ball.

The authors also performed a test of the representativeness error theory, and it failed. They reasoned that the more a sequence of eight draws deviated from representativeness with longer streaks of the same color, the stronger tendency should be to engage in the gambler's fallacy, but this did not hold up. At least for the methods used by Xiang and colleagues (2025), deviations from representativeness appeared not to explain the results.

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In science, every truth is tentative—especially new ones. Additional facts frequently emerge to change our current understanding. With respect to these presumed failures to recognize the independence of independent events, it looks like the hot hand fallacy may not be a fallacy after all. Science has pivoted and scored a goal for the thousands of professional players who knew it was real all along.

Unfortunately for the many irrational gamblers in the world, their fallacy is still a fallacy. However, cognitive psychologists assumed that the problem was at the level of calculating probabilities. The results of the Xiang et al. (2025) study suggest that's not it at all. People who were fully capable of accurately assessing the probability of the next event still employed the gambler's fallacy when making predictions about that ninth bingo ball. Why would someone who is able to determine the correct probability of an event still choose against that probability? It appears that the scientists have more work to do to answer that question. Perhaps we can check back later to see how they are doing. ■

Note

In all the studies cited in this article, I have simplified the issues tested, the methods used, and the results.

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[THE PRACTICAL SKEPTIC MICK WEST

Mick West is a writer, investigator, and debunker who enjoys looking into the evidence behind conspiracy theories and strange phenomena and then explaining what is actually going on. He runs the Metabunk forum and is the author of the book *Escaping the Rabbit Hole*.

Skeptical Empathy: Altered Mental States and the Supernatural

I had a fever of 103 degrees while fighting off a bacterial infection. As I lay in bed, I started to see some weird things. Across the room, in the semi-darkness, shapes began to take on the appearance of human faces. When I moved, the faces vanished. But if I just stared at the broad leaves of a plant across the room, they would gradually turn into faces, looking at me.

Everything seemed weird. I looked at my hands. They seemed surrounded by a black spidery web of thin dark lines, like negative slow-motion sparks. As I moved my hand, the black sparks swirled and vanished.

I drifted into semi-sleep. My brain was racing as I somehow felt I had discovered something really important—not to do with faces but with applying the JavaScript programming language to real-world physics. I couldn't quite grasp what it was, but it was where my mind went for the next hour or so.

I awoke—or at least it *felt* like I was awake. I could not move. I opened my eyes and looked around the room. I was lying in bed on my side. I tried to get up, but nothing worked. I could not even lift my arm, no matter how much I tried. I struggled for a while, but it was like I was bound in iron. I don't remember falling asleep again.

An AI-generated depiction of author Mick West's experience (ChatGPT)

Normal Brain Functions

All this makes sense. A high fever can disrupt normal brain function, especially in the visual cortex. This can lead to visual processing errors, such as enhanced pareidolia (seeing things such as faces in random patterns). Visual distortions are also common, which explains the "black sparks."

Sleep paralysis is also well known. My brain was awake, but my body remained in the state of muscle atonia that it enters to prevent me from physically acting out my dreams. This can occasionally happen in normal sleep, but it is more common in disrupted sleep, like that accompanying my fever.

My illusory insights into physics and JavaScript are also understood as a combination of fever dreams and hypnagogic (falling asleep)–related insights.

Hallucinating Aliens

Unpleasant though this experience was, I'm very glad I had it, because it gives me some valuable perspective into the experiences of others.

Altered mental states underlie a lot of pseudoscience and the belief in the supernatural, including some aspects of religion. As skeptics, we generally understand this and dismiss it as a scientific basis for those topics. But without having experienced those altered mental states ourselves, can we be effective communicators to those who have?

I often interact with people who think that UFOs are evidence of nonhuman intelligent entities, such as aliens or angels. Some of these people hold their beliefs because of an experience they have had that, quite likely, was like my fevered hallucinations.

Garry Nolan, a prominent UFOlogist, often—if somewhat inconsistently—tells a part of his origin story:

> I'm hardly the only individual to have had this as you wake up as a young boy. I would have been probably six or seven … of little men in the bed-

A typical scene from "The Discovery" showing a DMT-enhanced laser experiment (ChatGPT).

> room. You know, I mean, I was awake. I knew they were there. I could see them … It could have been a dream. But when—so here's the interesting thing. [Unintelligible] There's little men in the bedroom. And it went on, I guess, for a few weeks, and then it just stopped. (Colavito 2022)

Later in life, Nolan saw the cover of Whitley Strieber's book *Communion*, which featured a prototypical grey alien. He thought this looked like the "little men" he had encountered. He then read John Mack's book *Abduction: Human Encounters with Aliens* and recognized similarities with his own experience, in particular the fact that many people who thought they had been visited by aliens described being paralyzed during the encounter.

Making the Academic Real

Before my fevered hallucinations, my understanding of purported alien visits and abductions was essentially academic. I knew that sleep paralysis and hypnogogic hallucinations were a thing, but without experiencing them myself, it was hard to see how people could consider them real. I had occasionally hallucinated spiders dropping from the ceiling onto my bed years ago, but while it seemed real for a few seconds, it quickly faded from reality into a dream-like memory.

But after a sustained period of hallucinating faces in my room, this changed. To a degree, I could now see how people could come to believe their experiences were real. From the perspective of their brain, they were real. Once an experience becomes a memory, it makes no real difference to the brain whether it's based on reality or hallucination; it's an experience whether real or only remembered.

Laser Speckle

In October 2024, I came across a YouTube video that made an extraordinary claim. A group of people had discovered that they could see what they described as "code" by staring at the reflection of a laser beam projected onto a wall (Dan Go Thoughts 2024). The code, they claimed, looked like alien Chinese characters. The catch was that you had to smoke DMT (dimethyltryptamine) before you could see the code.

DMT is a powerful psychedelic compound that occurs naturally in certain plants and animals. It is known for inducing intense but brief hallucinations and altered states of consciousness involving vivid visuals, encounters with entities, and profound shifts in perception of time and reality. DMT is a Schedule I controlled substance in the United States, making its possession or use illegal outside of approved research.

This raises certain barriers to replication. The claim (that you can see the source code of the universe) is obviously ridiculous, but because it's essentially a subjective experience that requires altered mental states, it's not something you can trivially falsify.

But is it something we can understand? Is it at all possible to get a sense of empathy with a hallucinating person so that you might have a fruitful conversation with them?

The video struck my interest because of something I'd noticed, again while falling asleep. This time I was not delirious, simply sleepy. I'd open my eyes, and there in front of me would be a miniature scene. Once it was a rustic bar, once a Swiss village. Then I'd move slightly, and the scene would vanish. I discovered in each case that I was simply looking at my Apple Watch.

Very close to my face, the glowing numbers, pips, and little colorful widgets that I had in my personal setup were entirely out of focus, but somehow my brain had interpreted them as a complete scene that was entirely in focus. The effect reminded me of those popular Magic Eye stereograms, where you stare at a pattern of dots until suddenly a sharp-edged 3D image emerges. Except in my case, there was no actual image encoded in the blurry watch, only in my mind.

I (carefully) did some experiments with an eye-safe laser. I found that if you looked at the beam reflected on a surface just right, you'd see a pattern of dots that seemed to hover in 3D space, perfectly in focus, even if your eye was right next to the paper. I learned this is called "laser speckle."

I naturally combined these two discoveries. Perhaps the psychonauts were seeing the laser speckle like I saw my Apple Watch, and they had an altered mental state on DMT like I had from falling asleep. (There's a theory that the body might even produce DMT naturally when falling asleep.) Was what I saw what they saw?

I posted a thread on Metabunk describing my findings (West et al. 2024). People who had actually taken DMT

and looked at lasers joined the conversation and told me in no uncertain terms that I was wrong. It wasn't laser speckle. Falling asleep was nothing like DMT. I didn't see the code in my watch.

I was disappointed but not entirely surprised. I was talking to people who felt like they were Neo in *The Matrix*. They had pierced the veil of reality; I had not, and I was telling them that their paradigm-altering experience was just a hallucination. It was only natural that they would push back.

Should I Take DMT?

A joke that fans of Joe Rogan used to make is that at some point, he would always ask his guest if they had tried DMT. I think he even asked me once. Rogan is interested in altered mental states and suspects they reveal some normally inaccessible plane of existence. DMT is something he thinks gives access to "real" reality and that you can't understand anything unless you've had this experience—a belief that is shared by many people, including our laser-staring friends.

They, too, tried to persuade me to take DMT. They said there was simply no way I could understand what they saw without actually sharing the experience. DMT, they assured me, was totally safe.

I was only slightly tempted. While it may be physically safe, there are psychological risks that vary by individual. The legal status of the drug is an obvious problem, and any illegally sourced amount is likely to have uncertain potency and the potential for other unknown drugs to be added. While it's intriguing, I don't feel it's worth the risk.

The Value of Empathy

Empathy serves two purposes: understanding and communication. First, to understand someone's claim, you have to be able to see it from their perspective. Skeptics are generally good at the nuts and bolts of a topic, but occasionally we miss the boat when it comes to understanding. "How can anyone believe this nonsense?" can be a common refrain. Understanding "how" is a key part of fixing the problem—at least on the individual level.

Johann Heinrich Füssli's *The Nightmare*, a 1781 depiction of sleep paralysis and hallucinations

Second, empathy (and the understanding that comes with it) helps with communication. Skepticism isn't just about pointing out the logical flaws in claims and arguments; it's about helping people. If you can demonstrate that you actually understand their experience, and especially if you can relate a similar experience you've had, then this will build trust and get people to actually listen to you.

There are limits. I'm not going to take DMT, and I don't recommend that other people do either. But we've all had altered mental states to one degree or another, and we can all try to draw parallels between what people are telling us they experienced and what we experienced ourselves.

We can empathize about many things: health concerns, excessive government scrutiny, seeing weird objects in the sky, corruption (including conspiracies), odd coincidences, religious experiences, and our natural questions about the nature of reality.

And while we don't have to go all the way down the rabbit hole, we can still put ourselves in their shoes in a practical way. I can stare at a star until the autokinetic effect makes it wobble and move like a UFO. I can watch the night sky after a couple glasses of wine. I can (cautiously) stare at reflected lasers. I can observe and reflect upon what happens as I fall asleep.

Skeptics think of the scientific and supernatural/pseudoscientific worlds as separate realms. But they are ultimately interpretations of our experiences with reality. One is rooted in empirical observations and testable hypotheses, but the other seems to make more sense to different people. There's nothing to stop us from understanding and even relating to why someone picks one over the other.

We are at war with anti-scientific and anti-secular forces, but we are not at war with individuals who have been swept up by those forces. Empathy, as much as possible, will help *everyone* make progress. ■

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[INSIDE IMMUNITY ANDREA LOVE

Andrea Love, PhD, is an immunologist and microbiologist with over a decade of experience. She is a subject-matter expert in infectious disease immunology, cancer immunology, and autoimmunity and is adept at translating complex scientific data and topics for the public and healthcare providers. Love is the author of *Immunologic*, a newsletter and science information hub, and is the executive director of the American Lyme Disease Foundation.

From Food Dyes to Vaccines: Fear of Chemicals Endangers Us All

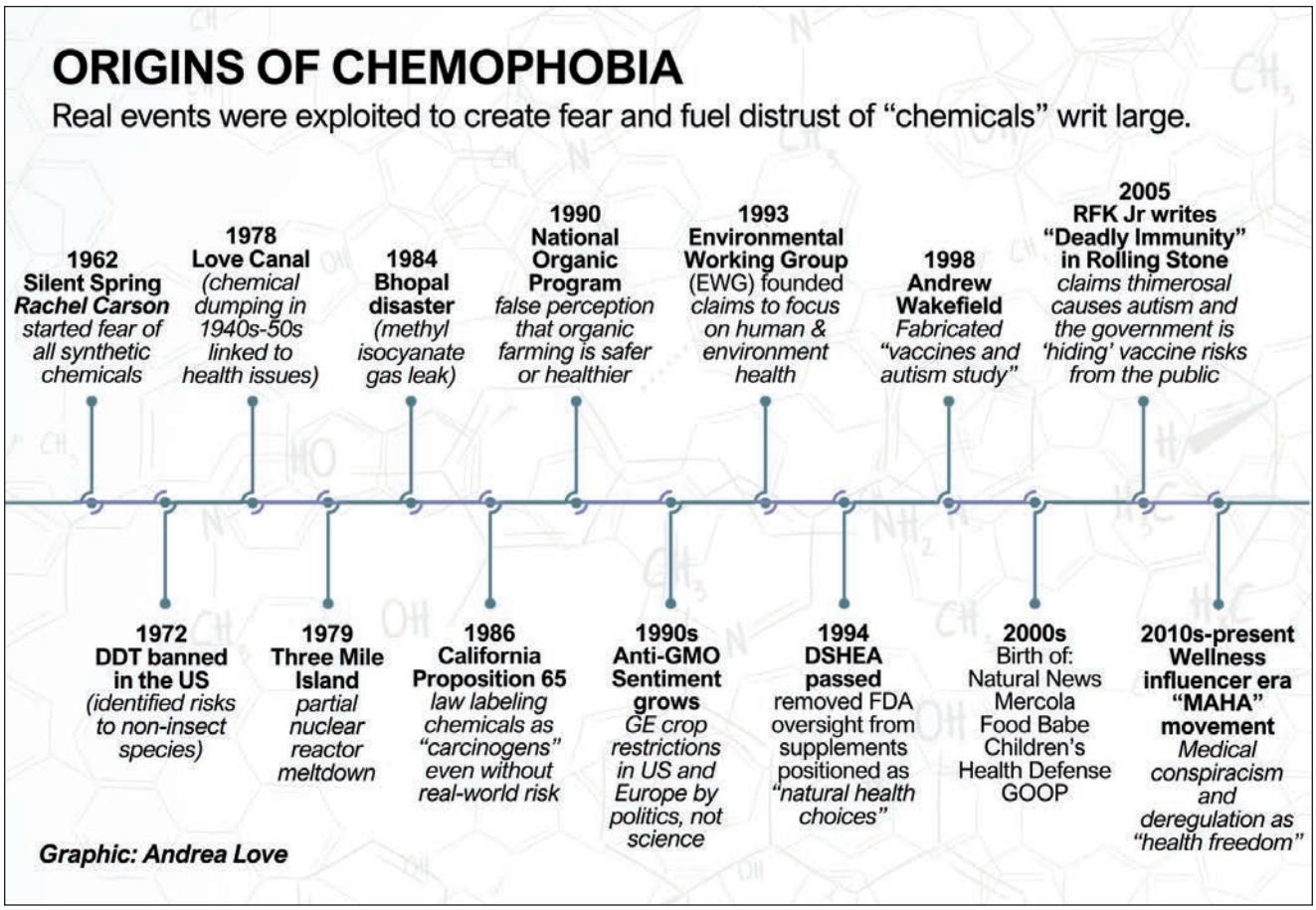
From tampons to tap water, from cereal boxes to vaccines, nearly every modern health scare rests on the same myth: chemicals are killing us. This fear—chemophobia—has become one of the most powerful engines of misinformation worldwide.

The World Health Organization (WHO) lists vaccine hesitancy as a top global health threat (World Health Organization 2019), but I'd argue that chemophobia is a more pervasive problem. It's the thread that links all forms of science rejection; it fuels fear around vaccines, food, medicine, agriculture, and cosmetics.

Chemophobia, the irrational fear or aversion to chemicals, is everywhere—whispered in parenting Facebook groups, shouted by influencers, amplified by media outlets that should know better, and weaponized by politicians. It's the hidden language of health misinformation.

You've seen it:

- Headlines about "heavy metals in tampons"
- Myths about vaccines containing "toxic" ingredients
- Legislative bans on synthetic food dyes
- Public outcry against fluoride in drinking water


ORIGINS OF CHEMOPHOBIA
Real events were exploited to create fear and fuel distrust of "chemicals" writ large.
1962 Silent Spring Rachel Carson started fear of all synthetic chemicals
1972 DDT banned in the US (identified risks to non-insect species)
1978 Love Canal (chemical dumping in 1940s-50s linked to health issues)
1979 Three Mile Island partial nuclear reactor meltdown
1984 Bhopal disaster (methyl isocyanate gas leak)
1986 California Proposition 65 law labeling chemicals as "carcinogens" even without real-world risk
1990 National Organic Program false perception that organic farming is safer or healthier
1990s Anti-GMO Sentiment grows GE crop restrictions in US and Europe by politics, not science
1993 Environmental Working Group (EWG) founded claims to focus on human & environment health
1994 DSHEA passed removed FDA oversight from supplements positioned as "natural health choices"
1998 Andrew Wakefield Fabricated "vaccines and autism study"
2000s Birth of: Natural News Mercola Food Babe Children's Health Defense GOOP
2005 RFK Jr writes "Deadly Immunity" in Rolling Stone claims thimerosal causes autism and the government is 'hiding' vaccine risks from the public
2010s-present Wellness influencer era "MAHA" movement Medical conspiracism and deregulation as "health freedom"
Graphic: Andrea Love

- The Environmental Working Group's annual *Dirty Dozen* list, warning about "toxic pesticides" in produce
- "Paraben-free" or "preservative-free" marketing slapped on cosmetics, sunscreens, and even foods

If you didn't know better, you might think you and your family are in constant danger. You're not. Instead of protecting people, chemophobia increases costs, reduces safety, harms public health, and stalls lifesaving science.

What Is Chemophobia?

Chemophobia claims that synthetic chemicals are inherently harmful, while "natural" chemicals are safe—a textbook example of the appeal to nature fallacy.

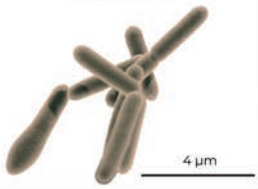
Chemophobia gained traction in the mid-twentieth century, following real industrial disasters such as Love Canal, Three Mile Island, and the Bhopal gas leak. Those events, which led to justifiable concern, were used to demonize all "synthetic" chemicals. Rachel Carson's *Silent Spring* (1962) fueled the flame: "The chemicals to which life is asked to make its adjustment are no longer merely the calcium and silica and copper … they are the synthetic creations of man's inventive mind … Such ingenious manipulations have produced a battery of poisons of truly extraordinary power."

Carson was a gifted writer and a marine biologist. Her work contributed to the EPA's creation and the restriction of DDT use, which helped eliminate endemic malaria in the United States during World War II (Centers for Disease Control and Prevention 2024). But while DDT saved lives from mosquito-borne disease, it also caused ecological damage in birds, where exposure thinned bald eagle eggshells, leading to fragile eggs and high chick mortality. The ecological risks outweighed the benefits, though the danger was not to humans.

Carson contributed to important scientific efforts, but she wasn't a chemist or toxicologist. By framing all "synthetic creations" as a "battery of poisons," Carson unintentionally left a legacy of exaggerated distrust toward synthetic chemicals.

That distrust metastasized into today's chemophobia, even while we know the source of a chemical has no bearing on its potential harm or safety. Many of the most toxic chemicals we know of are all-natural: among them botulinum toxin, abrin, ricin, arsenic, and cyanide.

On the flip side, synthetic chemicals can be lifesaving. Aspirin (acetylsalicylic acid) exists because chemists improved the natural compound salicin, making a safer and more effective pain reliever.

Natural Chemical	Source	Effects of Exposure	Lethal dose (LD50)
Botulinum toxin	Soil bacteria: *Clostridium botulinum* 	**A neurotoxin:** inhibits nerve function. **Causes:** blurred vision, difficulty swallowing, slurred speech, constipation, urine retention, paralysis of breathing muscles, muscle weakness, flaccid paralysis (halts muscle contraction), respiratory collapse, and death. **It is one of the MOST potent toxins known to humans.** It is at least 100,000 times more lethal than sarin.	Intravenous (injection): 0.005 microgram (µg) per kg body weight *(0.000000005 g)* Ingestion: 1 µg per kg Inhalation: 0.003 µg per kg (0.000000003 g) A 70 kg (154 lb) adult can die from ingesting 70 µg (0.00007 g) of all-natural botulinum toxin.
Ricin	Castor Beans	**A toxalbumin protein:** interferes with ribosome function (protein synthesis). **Causes:** nausea, vomiting, dehydration, gastrointestinal bleeding, seizures, multi-organ failure, and death.	Ingestion: 1–20 milligrams (mg) per kg body weight Inhalation: 1–3 µg per kg A 70 kg adult can die from ingesting 70 mg (0.07 g) of ricin.
Abrin	Rosary Pea (Jequirity Bean) seeds	**A toxalbumin protein:** interferes with ribosome function (protein synthesis). **Causes:** nausea, vomiting, dehydration, gastrointestinal bleeding, seizures, multi-organ failure, and death.	Ingestion: 10 - 1000 µg per kg body weight (0.00001 g) Inhalation or Injection: 0.1–0.7 µg per kg (0.0000001 g) A single seed chewed (not swallowed) can kill someone.
Arsenic	Soil, sediments (rocks & minerals), groundwater, volcanic eruptions.	**A chemical element:** inhibits cellular respiration which leads to cell death. **Causes:** nausea, vomiting, abdominal pain, difficulty breathing, multi-organ failure, cardiovascular collapse, coma, and death.	Ingestion: 0.002 grams per kg body weight. A 70 kg (154 lb) adult can die from ingesting 0.1 grams of arsenic trioxide.
Cyanogenic glycosides release hydrogen cyanide (HCN) when metabolized	Apple seeds, almonds, yuca, stone fruit pits, flaxseeds, elderberries, lima beans, bamboo shoots	**HCN, a chemical:** inhibits mitochondrial function which leads to cell death. **Causes:** headache, dizziness, confusion, shortness of breath, tachycardia, respiratory failure, seizures, coma, & death.	Ingestion: 1–2 mg per kg body weight (hydrogen cyanide). A 70 kg (154 lb) adult can die from ingesting 70 mg, roughly 40 apples worth of seeds

created by Andrea Love for Immunologic

Many lifesaving chemotherapies are synthetic derivatives of natural chemicals altered to improve effectiveness and safety.

Chemophobia paints synthetic chemicals as the villain in such common comments as:

- "I only want natural ingredients."
- "If you can't pronounce it, don't eat it."
- "Vaccines are filled with harmful chemicals."
- "GMOs aren't natural, so they must be bad."

Fear in a soundbite beats nuance, especially when leveraged as a marketing ploy by the wellness industry. If synthetic is "bad," then their "natural" alternatives must be safer, healthier, more beneficial, and even more eco-friendly—because they are trying to convince you that modern science and tools developed by it are evil.

But your body doesn't care if a molecule was isolated from a plant or synthesized in a lab. Vitamin C is vitamin C (scientifically, it's actually (5R)-5-[(1S)-1,2-Dihydroxyethyl]-3,4-dihydroxy-5H-furan-2-one). Formaldehyde is formaldehyde (and yes, your body makes much larger levels of formaldehyde every day than you would ever encounter in a vaccine). What matters is dose, not origin. All-natural botulinum toxin is a million times more toxic than synthetic sarin—yet people willingly inject that into their faces while fearing preservatives in bread.

This context is almost always omitted from public discourse, where media outlets, influencers, and even policymakers repeat false claims about chemicals without scientific evidence. Even among individuals who vocally proclaim to support science, you see anti-science actions rooted in chemophobia. That's why Democratic governors ban artificial food colorings without considering that they'll be replaced with naturally derived coloring chemicals that are less studied, less safe, and more ecologically damaging. That's why Democratic legislators move to restrict the use of glyphosate, one of the safest herbicides, while conveniently ignoring that this would force farmers to use weed control measures that are more toxic, less effective, and have broader ecological impacts. That's also why European governments restrict genetic technologies in farming, even while they embrace the same science for cancer therapies.

Chemophobia Thrives on Low Chemistry Literacy

Only 28 percent of Americans are civically scientifically literate, meaning they can find, understand, and apply science to policy decisions (Miller 2016). So, when voters are told fluoride is "toxic," they predictably vote to remove it. When they've heard for decades that glyphosate causes cancer, despite data showing otherwise, they support bans. And when new parents are bombarded with disinformation from Moms across America or the Environmental Working Group (EWG), they make choices that don't actually protect their families but do drive profits for those spreading the fear. While many believe these organizations have their best interests in mind, they are major contributors to disinformation. Moms Across America is an activist organization founded in 2013 that spreads pseudoscience and chemophobia about GMOs, pesticides, vaccines, and food additives. EWG is a nonprofit and lobbying organization best known for its annual "Dirty Dozen" list and alarmist rankings of consumer products and foods. Most people don't know that they also spread objective lies about vaccines—something they have attempted to scrub from their history. EWG is one of the biggest propagators of chemophobia, routinely exaggerating risks of chemicals for their financial benefit.

This isn't just an American problem. In Europe, 40 percent of adults say they'd prefer to "live in a world without chemicals," and nearly a third openly fear them. Ninety-one percent don't grasp that toxicity depends on dose, and 82 percent don't know that table salt is always sodium chloride (NaCl), whether isolated from nature or synthesized in a laboratory (Siegrist and Bearth 2019).

Too many people forget that chemistry shapes their existence—food, medicine, clean water, even their smartphones and homes—until it is used to stoke fear (Saleh et al. 2019). Combine that with a "do your own research" culture where Google and TikTok pass for toxicology training, and chemophobia spreads unchecked.

Chemophobia Shapes Policy—and Not in a Good Way

Chemophobia doesn't just distort individual choices; it influences lawmaking across political ideologies and harms public health as a result.

Chemophobia hinders the development of crops using genetic engineering that can withstand more extreme climates, grow in places that were previously inhospitable, and produce higher yields with fewer pesticides. Chemophobia drives anti-vaccine opposition, slows development of novel therapeutics, fuels unfounded fears about medicine ingredients, and erodes trust in evidence-based science and medicine (Saleh 2021).

Chemophobia leads to banning safe food ingredients and demonization of healthy fruits and vegetables, causing people to avoid nutritious food, which, unlike the pesticide residues they fear, actually does pose a health risk (Huang et al. 2016). Chemophobia forces consumer product companies to kowtow to public outcry and remove safe and effective ingredients (such as preservatives), increasing costs, reducing safety, damaging the environment, and legitimizing misinformation.

The most dangerous expression of chemophobia right now is RFK Jr.'s "Make America Healthy Again" (MAHA) agenda, now that he has been empowered with control of the Health and Human Services agency. MAHA is marketed as a bipartisan "health" platform: rhetoric around healthy foods, chronic health issues, and environmental contaminants. But peel back the façade, and it's a full-blown chemophobia manifesto, the magnum opus of RFK Jr.'s forty-year anti-science career. None of it will make Americans healthier.

MAHA appeals to anti-GMO and anti-pesticide sentiment among

left-leaning people who, ironically, have been misled by decades of anti-science rhetoric by RFK Jr. and his allies. Organic purity narratives blend with "ban preservatives" rhetoric, while building on distrust of corporations and "Big Food." This same tactic fueled the original anti-vaccine activists, many of them left-leaning individuals concerned about toxic vaccine ingredients.

MAHA appeals to the right by branding chemophobia as government overreach: the FDA and EPA are "poisoning" citizens with vaccines, fluoridated water, and processed foods. It feeds broader anti-regulation, anti-institution ideology that led to the 1994 Dietary Supplement Health and Education Act (DSHEA), which removed FDA oversight of dietary supplements and drove exponential growth of the wellness industry (Swann 2016).

Chemophobia is uniquely dangerous because it transcends political lines. RFK Jr. doesn't need to persuade people on policy specifics; he only needs to stoke distrust in "chemicals" or legitimate qualified experts who try to educate people, and fear does the rest.

MAHA positions have already seeped into legislation. The Department of Health and Human Services adopted a federal policy legitimizing falsehoods about thimerosal, used globally to prevent contamination in multidose vaccines. They have halted $500 million in funding for mRNA vaccine research, claiming it is a "risky" technology. Multiple states around the country are pursuing bans on "genetic medicines" based on the same reasoning.

This year Utah and Florida banned fluoridation of public water, even while nearly eighty years demonstrate its benefit for dental and overall health. Legal challenges that block cultivation of golden rice, a lifesaving farming technology, have drawn support from environmental activists and conservative conspiracy platforms (Love 2025b). California food dye bans were cheered by left- and right-leaning wellness influencers similarly touting it as the path to healthy food. It isn't; it instead legitimizes false claims that these colorings are harmful while global experts have asserted their safety. Chemophobia is the common theme.

Chemophobia thrives on the risk perception gap between real and perceived risks (Brown 2014). People fixate on Red Dye 40 in snacks while ignoring real systemic factors that impact health, such as healthcare inequities, income inequality, and food deserts (Love 2025a). They avoid nutritious foods because of unfounded pesticide fears but freely consume unregulated supplements full of untested compounds. This double standard distorts personal decisions and public policy and harms society.

Chemophobia has staying power because it is applicable to every single topic in science and health. Today it's food dyes, tomorrow it's pesticides, next week it's vaccines. The narrative doesn't require data—only fear of the chemical boogeyman.

We All Need to Recognize Chemophobia as a Global Health Threat

If we want better health and smarter policy, we must confront chemophobia. That starts with science literacy—basic chemistry, toxicology, biology, and, yes, media literacy. Education matters, but so does accountability. Stop confusing notoriety with expertise. A podcaster saying "trust me" is not a credential. Journalists need to quit amplifying clickbait and start quoting real experts, not wellness influencers. And elected officials must write laws based on evidence, not vibes, polls, or lobbyists' checks. Scientists can contribute by meeting the public where they are, using plain language, acknowledging fears, and fact-checking loudly and often. If we don't, misinformation gets a free pass.

Chemistry underpins everything—medicine, food, clean water, sustainability, climate science. Yet public fear of "chemicals" stalls progress, raises costs, and undermines safety. Chemophobia thrives because fear is profitable, politically useful, and amplified by powerful networks. Scientists fighting it do so on our own time, without the money or infrastructure backing the fear machine. Until society treats chemophobia as the public health crisis it is, we'll keep losing ground.

Chemophobia isn't a nuisance; it's a global health threat. If you consider yourself a skeptic, this is your call to action: challenge chemical fearmongering wherever you see it—even in yourself. Our health, our safety, and our future depend on it. ■

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[SKEPTICAL INQUIREE BENJAMIN RADFORD

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Explaining Aligned Alien Abductions

Q: **How can alien abduction experiences align even when individuals recounting them are completely unrelated? When people recall alien probings, their descriptions are similar and reminiscent of what patients see during surgery. Could alien encounters be memories of misremembered (but real) medical procedures?**

—Emma F.

A: As a skeptical researcher, I've often been asked this question, usually framed as some sort of insurmountable mic drop rebuttal that a skeptic would struggle to answer: "If you claim that UFO abductions, near-death experiences, Bigfoot sightings, miracles, ghosts, and so on aren't real—and are instead the result of hoaxes, misperceptions, optical illusions, and so on—then how could so many unconnected people all over the world possibly describe the same thing? How could all of them be wrong?"

Part of the reason it's such a *prima facie* compelling argument is that multiple alleged eyewitnesses seem to rule out a hoax or misperception. Sure, one or two people might be confused, stoned, fooled, or hallucinating, but not so many people at one time. On its surface, the argument seems ironclad, and as a general rule it's valid: If you have different people independently verifying the same information or giving similar accounts, that's evidentially pretty compelling.

This premise, while logical and plausible, has limitations, especially when extraordinary claims are involved. In many cases, what we have is merely the *illusion of corroboration*. The famous Catholic miracles of Fatima are one example (see Nickell 2009), and there's also my investigation into the haunted KiMo theater, in which claims of hundreds of firsthand eyewitnesses to alleged poltergeist activity were categorically debunked (see Radford 2009). There's also the dozens of (nonexistent) eyewitnesses to child abductions by UFOs in Berkshire, Massachusetts (Radford 2024). Of course, every day around the world, large groups of people with no connection to each other do sincerely report experiencing events that did not actually happen; they can be found in magicians' audiences. In short: yes, it is quite possible for multiple seemingly independent people to simply be wrong.[1]

More broadly, there are a few things to note. First, claims about the uniformity of eyewitness accounts are often exaggerated. It's easy to make a blanket statement such as "Bigfoot eyewitnesses are all seeing the same thing," but if you actually look at the data, you find that there is in fact quite a bit of variation in descriptions of the beast(s), ranging widely in size, color, and morphology (see, for example, Loren Coleman's *A Field Guide to Bigfoot and Other Mystery Primates*). When it comes to descriptions of the chupacabra, depending on which book you read (or whose eyewitness account you credit) the chupacabra either has a powerful tail or it has no tail at all; it either spends most of its time flying in the night skies—or doesn't because it lacks wings. It might have three fingers on each hand or four; it might have a row of distinctive spikes running down its back—or it might not. Its ears are either big, or they are absent. Remarkably, several writers (including Herbert Genzmer and Ulrich Hellenbrand in their book *Mysteries of the World*) conclude that "The descriptions are, for the most part, very similar"!

So, invoking Ray Hyman's dictum, before trying to explain why so many disparate eyewitnesses are reporting the same thing, first confirm that they in fact are. If they're not, and the assumption is wrong, there's nothing to explain.

Alien Influencers

Emma's question, however, has a very specific context. Dozens of people claim to have been abducted by aliens. They were allegedly subjected to experiments, implantations, and other bodily intrusions. Most alien abductions are not

1. It's also important to remember people sometimes confess to things they didn't do and could not have done. In one notorious case, five Black and Latino teenagers were arrested in 1989 for the brutal rape and assault of a White jogger in New York's Central Park. The teens were widely portrayed in the press as part of a "wolf pack" during a Central Park "wilding" spree that included vandalism, assault, rape, and attempted murder. The boys, who were in the park at the time of the assault, were rounded up and arrested by police. All denied attacking the woman or even knowing that it had occurred. But the police, under pressure to make an arrest and reassure the public that the famous Manhattan park was safe, quickly decided they had the right suspects. After hours of interrogation, the teens began to confess to their role in the attack, incriminating both themselves and each other. They all confessed, and they corroborated each other's eyewitness accounts. It was an open and shut case—except that they were all innocent. The key here is that they were provided a specific narrative that they embraced and endorsed.

reported immediately but only retroactively, during hypnosis. This, of course, is inherently problematic because while hypnosis has real-but-limited psychological applications, it often elicits fantasy, confabulation, and false or "recovered" memories—of anything ranging from sexual abuse to alien abductions. Many people come to fully believe they were abducted or abused when they were not.

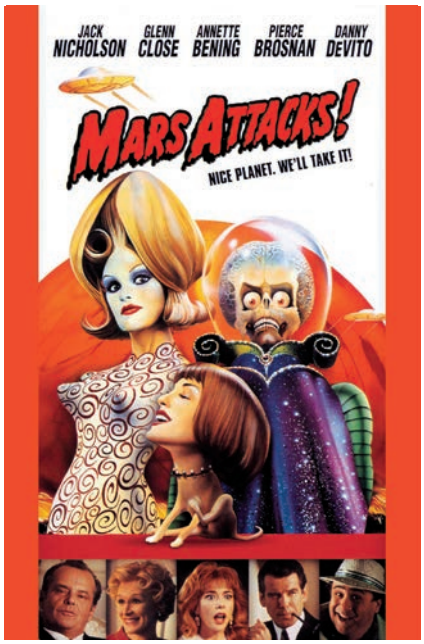
In terms of people who don't know each other having similar alien experiences, there are several reasons for this. One powerful influence is popular culture. How can people all over the world—in different cultures and at different times, who don't even speak the same language and have never met each other—give similar descriptions of Bigfoot, ghosts, near-death experiences, alien abductions, and the like?

It's the same reason that if you ask children in America, Brazil, Kenya, Norway, and Australia to describe a dragon, their descriptions will be amazingly similar. They will have some different details, but overall the images will align closely. Why is that? It's not because the children around the world had independent, firsthand sightings of dragons. It's because they are everywhere in pop culture, from cartoons to *Game of Thrones* to Dungeons and Dragons. It's exactly the same with aliens, ghosts, Bigfoot, and so on.

Researchers have shown that sleep paralysis may often be misinterpreted as an alien abduction. People report being paralyzed, feeling an otherworldly presence, often accompanied by sensations of physical pressure (pushing or probing) and fear. These are universally reported experiences[2] (see also Mick West's column in this issue). To psychologists, it's clear why the experiences—if not their interpretations—would be similar: we're all wired with the same human brain. It's the same reason reports of near-death experiences are similar across disparate cultures and demographics: an oxygen-starved brain flooded with dopamine and other chemicals can give the experience of seeing lights, going through tunnels, hearing voices, seeing friends and relatives, and so on, regardless of whether you're a ten-year-old Pakistani boy or a seventy-year-old Canadian woman (see Blackmore 1993).

We also see an increase in reports based on pop culture coverage. So, for example, reports of alien abductions, possessions, exorcisms, and monster reports tend to follow pop culture reports and TV shows and films. We would expect that if encounters with ghosts, monsters, or aliens were real, they would occur more or less routinely and randomly at a baseline level. Instead, we see very distinctive spikes (or, in classic UFOlogy, *flaps*), where they rise and fall based largely on pop culture. This is a well-documented effect in which news media and pop culture interest spurs popular interest, which in turn leads to

2. These experiences are filtered through cultural beliefs. In Muslim countries, for example, the presence will be attributed not to an alien or demon but instead a djinn (see Hufford 1982).



an increase in sightings regardless of any genuine reports. One of my favorite examples is when the sighting of Champ, the lake monster in Lake Champlain, jumped—not at the time of Sandra Mansi's famous 1977 sighting but instead only years later in 1981, when her iconic photograph of it was published.

Regarding the descriptions of medical alien experiences, while confabulated medical procedures is one possible explanation, Occam's razor is more useful than any alien-technology scalpel at cutting to the heart of this mystery. Keep in mind that medical dramas are among the most popular entertainment in America. There is no shortage of visual depictions of medical procedures in pop culture: *ER*, *Quincy*, *The Good Doctor*, *House*, *Grey's Anatomy*, *St. Elsewhere*, *Scrubs*, *Nurse Jackie*, *The Pitt*, and countless other wildly popular television shows are seen by hundreds of millions of people. Those watching the shows see reasonably accurate depictions of many medical procedures, from surgery to childbirth and drug overdoses to compound fractures. The information comes by osmosis, not careful, detailed study, and there's nothing inherently mysterious about it.[3]

Though media are saturated with these images, there is a less obvious influence: it can be as simple as hearing other people describe their experiences in detail. For example, alleged alien abductees have appeared for decades on popular radio and TV talk shows (*Coast to Coast* and *Oprah*, for example), at conferences, on podcasts, and elsewhere. Regardless of whether or not you've seen *E.T.*, *Close Encounters of the Third Kind*, *Fire in the Sky*, *The X-Files*, or any other alien contact film or TV show, just hearing or seeing somebody describing what they experienced (or what they *claim* to have experienced) can influence your own perceptions and memories, providing a template or guide for what elements, details, and themes to expect—and, more importantly, what other audiences expect—from an alien abduction story. So, you don't need to have had an extraordinary personal experience to give a compelling and plausible description of what that experience might be like. Hoaxers—like fiction authors and almost everyone else—have a pretty good sense of what's plausible in a given situation. If a person is claiming they were abducted or assaulted, the narrative they will offer will usually conform to a fairly standard set of tropes. They won't claim their abductor was a teen girl wearing a sequined dress who rode up on a horse; they will instead say it was a scruffy, heavyset male in a white van.

Thus, the uniformity (and alleged "astonishing similarity") of many paranormal experiences is in fact quite explainable when placed in context. Unusual experiences don't occur in a vacuum but are instead influenced by—and at times clearly the product of—psychological, cultural, and social beliefs and assumptions. ■

3. Any glaring omissions or errors in the descriptions are dismissed as the result of a traumatic event, not a cause for skepticism. After all, we can't blame the victim for not remembering everything in perfect detail—and if she says that her heart or lungs were somehow removed from her chest cavity without a drop of blood or leaving a scar, well that's just proof of how advanced alien medical technology is! The question is not why so many alleged alien abductees are reporting similar events but instead whether there is a shred of corroborating evidence and if they are reporting anything that is not depicted (or easily inferred) by watching medical dramas.

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How *Wicked* Reflects Real-World Intersections between Belief and Skepticism

A married couple discusses belief and skepticism in the Broadway show *Wicked* and the movie *Wicked, Part 1*. They also ponder what might occur in *Wicked, Part 2* (coming this November) and relate these dynamic themes to their own relationship.

MALORIE MACKEY AND MICHAEL MALDONADO

The desire to conform to often-misguided cultural norms—or even outright misinformation—was highlighted beautifully in the popular Broadway-show-turned-movie *Wicked* as it explored the parallels in how this journey to fit in can change us. Both the film and the stage show do an excellent job of showcasing how going against the grain can be immensely challenging while highlighting many skeptical undertones.

The *Wicked* franchise is a prequel to *The Wizard of Oz*, filling in the backstory of Elphaba (the Wicked Witch of the West) and Glinda (the Good Witch). Whereas *The Wizard of Oz* clearly identifies who is evil and who is good, *Wicked* flips the script by telling a story that reflects the life experiences and earnest motivations of the "Wicked" Witch.

Upon watching *Wicked* (both the Broadway show and the first movie), the parallel between Elphaba (the skeptic) and Glinda (the believer) became immediately clear to us as Glinda repeatedly compromises her integrity and abandons her reason to avoid confrontation and fit in while Elphaba, unwilling to do the same, is forcibly removed from society.

We are cowriting this piece together as a married couple. As we move through our daily lives, we regularly find ourselves mirroring the metaphor of *Wicked*, as many in this world do, likely without even realizing it. As such, for the rest of this article we'll be writing with each of our individual voices. Warning: this article includes a few spoilers.

Malorie Mackey: I often find myself stuck in the naive and child-like ignorance of Glinda, wanting to believe that magic is real and getting "excitified" (as *Wicked* fans like to say) by illusion. Michael, on the other hand, has naturally approached the world with a skeptical eye for most of his life. Like Elphaba (Elphie), he pushes against what may be some of the "normal" belief systems of society and questions everything, leaving me sometimes exclaiming, "I hope you're happy. I hope you're happy now," as Glinda does to Elphie. He has shown me time and time again that the resistance you frequently encounter as the skeptic is never easy. It's not comfortable to question your own or others' often unfounded belief systems, but many times it's the right thing to do, and it can be very rewarding in the end. This lesson is painted beautifully within the tale of Elphie.

Michael Maldonado: *Wicked* is set in the world of Oz and pulls us into an environment that, while magically different, is not actually that societally different from the world we live in. It all starts with the Wizard. Let's call him the "cult leader." He is also a *con artist*. He fully knows that he has no magical powers but lies to everyone because it makes him feel wonderfully powerful. He becomes the ruler of Oz, and with that, he quickly uses every trick he can to entice the people of the land to love him. His lust for power and respect progresses to a much darker and more painfully familiar form of deception in his attempt to bring the people of Oz together under his rule. He turns the greater part of society against a specific group of people, hoping a common enemy will strengthen

Steven Miller (aloha75) | Flickr

cohesion among the rest of society and strengthen his role as people look to him for guidance. He exploits differences, just as he exploits Elphaba's green skin easily, turning Oz against her. He willfully spreads misinformation to keep himself in power. After all, as the Wizard says, "The truth is just what everyone agrees on," right?

Mackey: Elphie and Glinda both personify different ways in which society can respond to this cult leader consolidating power. Let's start with Glinda, the believer. She comes in wanting to believe that the world will work the way she thinks it should, exemplifying the power of magical thinking. Her desire to believe in magic so desperately has her mesmerized by the Wizard, this cult leader ruling over Oz. Despite observing firsthand that he is not what he says he is, Glinda is initially unable to come to terms with the fact that he is deceiving her. She lies to herself time and time again, as the magic must be real, right? She then surrounds herself with people who credulously agree with her beliefs, comfortably reinforcing her own magical world. She has a difficult time accepting that her worldview must change given the new information she has learned. She claws to keep the world as she thought it was, as she wanted it to be. We all know people like that, right? I recognize my constant struggle with this nearly every day. I value my optimism, but blind optimism, when left unchecked in the face of disconfirming evidence, can slide into magical thinking.

Maldonado: Elphaba, our heroine, is the character who truly embodies skepticism, making *Wicked* a story about the skeptical mindset. Simply put, Elphaba is the skeptic. In the face of unimpeachable evidence, she adjusts her preexisting belief systems. She sees the truth about the Wizard and immediately drops all the preconceived notions she had of him. Her dreams of working with the Wizard are thrown away; she cannot live in a world of fantasy knowing the lies that exist just beneath the surface.

Her character highlights the value of abandoning the magic we want to believe in while recognizing the reality we live in, a reality where we can still discover and create our own form of magic. As any scientist or skeptic will likely recognize, there is real beauty and wonderment in the pursuit of ever deeper knowledge of our world. The scientific method focused through a skeptical lens has revealed to us a reality far more elegant than any work of fantasy; we just have to learn to see that magic for what it truly is. Elphaba highlights just such a journey. Her skeptical mindset and refusal to accept what she knows is false is both a blessing and curse. She is harshly expelled from society, but her immutable acceptance of reality is also the necessary catalyst for change, eventually culminating in the collapse of the Wizard's reign. As a doctor, I experience this resistance to evidence and reason firsthand every day. People are frequently irritated when their cherished belief systems are challenged, and human obstinacy to change (even my own!) never ceases to amaze me.

Glinda doesn't want to be broken out of her "pretty perfect" world. It's hard to change your mindset. Malorie and I face

this challenge regularly. We know that the way in which we both see the world is different, and if you are unable to initially understand that, finding common ground can be nearly impossible. We find our relationship paralleling the dynamic of Elphaba and Glinda regularly. Similarly, I'm sure you can find this parallel for yourself in some of your close relationships.

Mackey: When our two heroines are faced with the shattering news that the world isn't what they thought it was, they respond in dramatically diametric ways. Glinda, the believer, fights the truth at first, desperately finding a way to believe in the cult leader she has inherently worshipped for most of her life "because happy is what happens when all your dreams come true," as she says in the second act of the play. She tries to find a way to continue living in the world she knew while processing this clashing information. Her magical thinking initially blinds her, and she does nothing but ignore the evidence contradicting her worldview. She tries to get Elphie to put aside her cognitive dissonance and just accept the status quo, as I have done with Michael in the past. Eventually, she tries to find a way to work within and tweak the system the Wizard has built but falls short of directly challenging it.

As the believer, Glinda is both the victim and the victim-

izer. She is a victim of the Wizard and society, because she truly believed that this magic could be real, but that doesn't exonerate her from the fact that by promoting the cult leader, she too is victimizing others in society. Her journey begins to take her to this realization as she slowly stops allowing herself to be misled and victimize others. With abundant examples from our own society, it's important to point out that spreading misinformation is harmful. Many victims of misinformation become the perpetrators of the very same misinformation. For example, in a topic dear to Michael, many people considered "vaccine hesitant" are effectively victims of a small set of charlatan deniers but they, in turn, become victimizers by spreading this dangerous misinformation.

Maldonado: Elphaba, on the other hand, as the skeptic, tackles the problem head on, coming to terms with it almost too quickly. When Elphaba says "Something has changed within me. Something is not the same. I'm through with playing by the rules of someone else's game," she means it. She chooses reality. She understands that for her, a magical lie that she knows is just a lie is no world for her to live in. She manages to incorporate the new evidence and accept this updated reality quickly despite it not being the outcome she wished for. The tone is set, and for the rest of this story, we will see her fighting against a world of magical thinkers to live in reality, even if it's not the world she originally desired.

Elphaba tells us plainly that if we learn to accept the world and live in the magic of what *is*—and I think our readers can agree that the scientific discoveries of our world can be quite magical—we can learn to "defy gravity" (like the hit song with that title from *Wicked*) and with it, society. By staying true to our skeptical selves even in an environment that may not be initially receptive to it, we get the chance to experience the personal victory that comes with seeing the impact of nudging stubborn mindsets toward an evidence-based reality. As skeptics, we replace superficial illusions, defy cult-like mindsets, and slowly educate those who have been mired in misinformation. This is something I strive to emulate every day. Like in Elphaba's case, as she is demonized for "defying gravity" and the Wizard, maintaining a skeptical outlook can place us at odds with ingrained belief systems but by so doing we can promote lasting, reality-based change.

Mackey: The other important characters of Oz become clearly defined as the story reveals itself, and each and every key figure has a counterpart in the skeptical world. For example, Fiyero is the dashing prince who takes the school by storm in the first act. He entices the students by rebelling in a way that fits into what society would like. He pretends to be careless while hiding that he is, in fact, someone who cares deeply for the world. By the time he takes a stand for what is right, he gets cursed into appearing as the thoughtless man he pretended to be.

If he only had a brain! Exclaiming "Life is painless for the brainless," Fiyero embodies what many in the skeptical movement have referred to as a *shruggie*, a term made popular by Drs. Steven Novella and David Gorski through their writings at *Science-Based Medicine*. But Fiyero teaches us that while many shruggies look away from strife at first, they can be recruited to skeptical activism if the right cause kindles their interest, as Elphaba ignited Fiyero's passion to stand against the Wizard.

Maldonado: Another student who plays a major role in Oz is Boq. He suppresses his love for Glinda and rather effortlessly conforms with what is expected of him. In doing so, he lives a passionless life as servant to a woman he does not love. Boq embodies the appeasers of our society, those who don't just shrug it off but rather acquiesce to the machinations of those who peddle misinformation as a way to keep the peace. But Boq is also a clear reminder that when we compromise our own beliefs to appease those around us, we lose our heart.

Skeptical Inquirer
Presents
HOW *WICKED* REFLECTS REAL-WORLD INTERSECTIONS BETWEEN BELIEF AND SKEPTICISM
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Similarly, the lion, while not exactly important in the story of *Wicked*, represents those too afraid to speak out for what's right. Driven by a fear of repercussion, the coward is appropriately informed but lacks the fortitude to stand for what they know to be right.

Mackey: Those who fall too deep into the pit of despair, as Nessarose, Elphie's sister, does upon Elphie's defiance, may find themselves becoming cynics. She is outwardly embarrassed by her sister in the first act and never offers any support before outright denying her sister and turning against her. Rather than being open to adjusting their own belief systems as they learn about the world, cynics solely see the negative in others. Nessarose is a reminder that when we become too cynical and allow the whole world (or a house) to come crashing down on us, not even a fancy pair of slippers can bring us back.

Maldonado: As the story of *Wicked* unfolds in the second act, the characters discover themselves, learn who they were meant to be, and recognize they are changed. The point of this piece, and one of our major skeptical takeaways from *Wicked*, is to stay true to your inherent skeptical nature. Don't allow yourself to feel defeated; there's always more work to be done. Defy gravity and make changes one small step at a time while remembering that you are unlikely to change someone's mind immediately in an argument. That's just not how human nature works. You can, however, slowly change people over time. By exposing people to truth and reason, you can eventually shift their way of thinking, ever so slightly, by providing new facts, just as Elphaba changed Glinda.

We mentioned above that the dynamic between belief and skepticism in our relationships can be challenging, but we hope to highlight that it is also rewarding. And it's important to remember that our ideas and belief systems are always adapting to the ever-evolving evidence entering our lives. I am no exception. I have found myself continuously shaped by new and refined information that has often moved me to become skeptical of ideas that I once took for granted—or, in other cases, to come to accept ideas that I initially scoffed at.

Mackey: Glinda became a better person because she knew Elphie and was exposed to the truth through a skeptical eye. She resisted it only to slowly become a more grounded person while finding her "braverism" (a term borrowed from Oz). In the end, the role of watching over Oz went justly to Glinda, a better-informed leader because of the role Elphie played in her life (just as Michael has begun to change my way of thinking one small step at a time). And let's not forget that Glinda changed Elphie in return. Elphie's sharp cynical edges became smoother as she learned to smile, becoming less abrasive and more open-minded because of Glinda. Strive to be an impetus of informed change in others while always remaining open to such change in return, and you may very well learn that pink does, in fact, go well with green.

Maldonado: This is the reason to keep fighting the good fight for critical thinking and skepticism. While it would be wonderful to see a quick and drastic change, that's unlikely to happen. It might not be obvious in the moment, but people and society can and do change over time, and by surrounding ourselves with the right people, we can all shift for the better.

Mackey: I've been changed for good because I knew you, Michael. Just as Glinda was changed for good by knowing Elphie. And in return, I've seen you soften and open your mind to more creative possibilities.

Maldonado: And I have been changed for the better because I knew you, Malorie. Throughout our relationship, you have shown me the value of being open-minded. Like Glinda, your ability to dream big and your refusal to take no for an answer has taken you to extraordinary places. While I'll always be here to ground you, I enjoy taking inspiration from the magic you create within your bubble.

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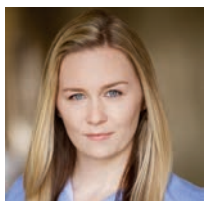
Wicked perfectly highlights how easily we can get caught up in the so-called "normal" functions of society. As social creatures, despite being aware of our vulnerability to being manipulated, we can still find ourselves giving up our principles to fit in. We give up aptitude to focus on the way we're viewed to become, well, popular or sacrifice reason in pursuit of an easier life. But it also reminds us that we can, in fact, challenge society and make a difference through skeptical reasoning and by questioning the way the world works. For the people in your life, go out there and hold to your own skeptical nature, despite how hard it may be, especially in today's tumultuous landscape. Be yourself, stay true to your skeptical guideposts, and change the people you love, and yourself, for the better.

> Because I knew you
>
> I have been changed
>
> For good.
>
> —*Wicked*, "For Good" ■



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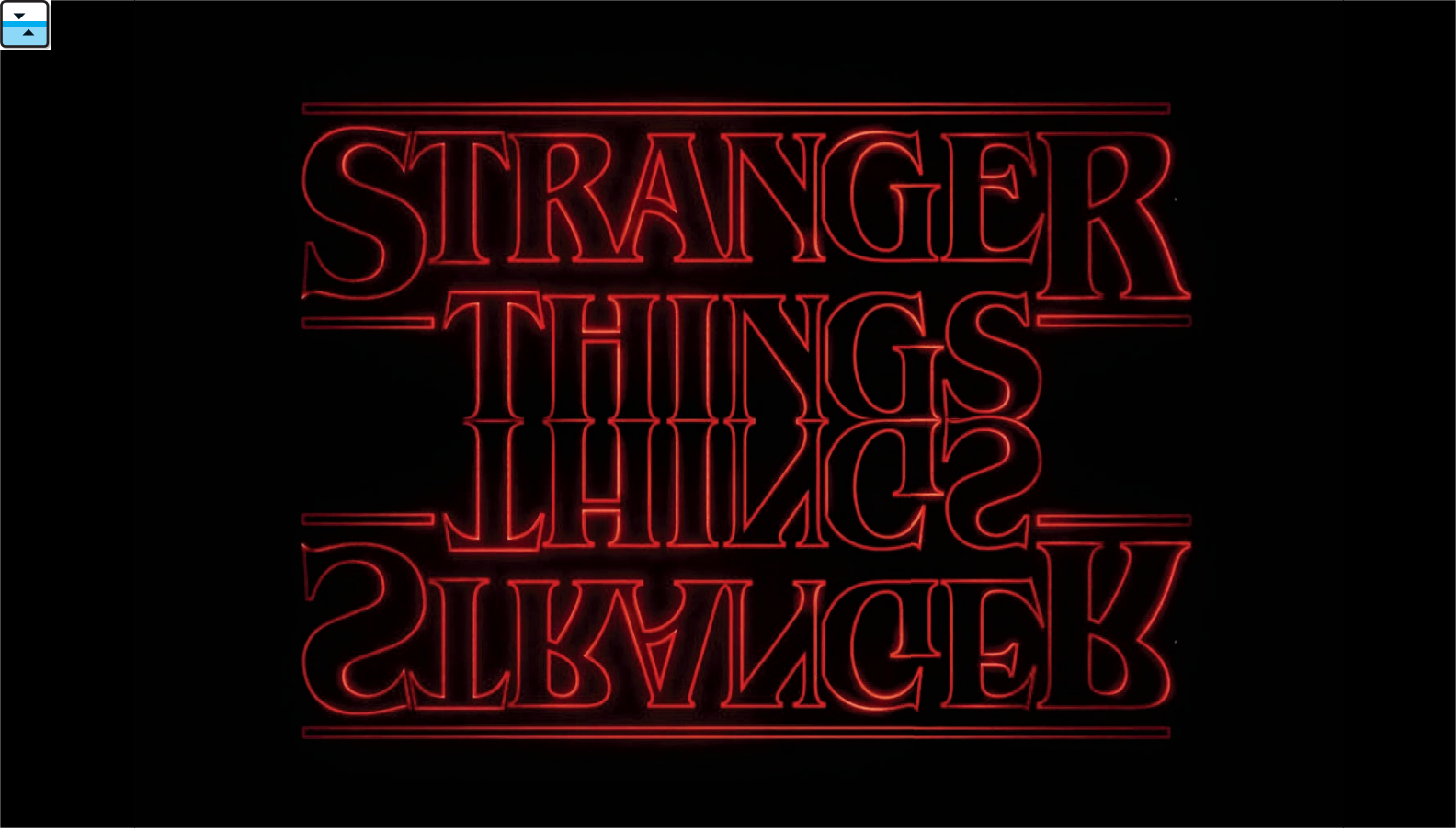


How *Stranger Things* Mirrors Real-World Paranormal Stories

As the final season of the hit show *Stranger Things* is set to air this November, a deep dive reveals parallels with the history of skeptical inquiry and the Committee for the Scientific Investigation of Claims of the Paranormal.

DANIEL A. REED

Since its premiere in 2016, *Stranger Things* has become a pop culture phenomenon. Set in the fictional town of Hawkins, Indiana, during the 1980s, the show chronicles the adventures of a group of teenage friends as they uncover the dark secrets hidden below the surface of their quiet town. What begins as a desperate search for their missing friend (Will Byers) eventually becomes a battle against sinister government experiments and interdimensional horrors. In its final season, the battlerages against the forces of evil to save the town of Hawkins—and perhaps the entire world itself!

The show is a nostalgic treat for those of us who grew up during that era. From the clothing and music to the technology of the time, *Stranger Things* immerses viewers in a world that is the very essence of the 1980s. Watching the show, we are taken back to a time when life was simpler and less electronically connected. Back then, if you wanted to find your friends, instead of simply texting them, you had to go look for them, and the only requirement your parents had was that you be home before dark. This lack of constant supervision and connectivity might seem unthinkable by today's standards, but for Generation X it was the norm.

Beyond nostalgia, *Stranger Things* also effectively connects viewers with the cultural anxieties of the 1980s. It was a time marked by the Cold War, a geopolitical standoff between the United States and the Soviet Union, which fueled fears about what governments—including our own—might be doing behind closed doors. At the same time, there was an increase in the public's fascination with psychic phenomena, with the likes of the alleged psychic (and spoon-bending phenom) Uri Geller becoming a household name. While some at the time,

such as actress Shirley MacLaine, sought to unlock their spiritual and psychic abilities (as chronicled in her 1983 book *Out on a Limb)*, others warned that such pursuits could lead people down dangerous paths that were best left untrodden (Weldon and Bjornstad 1984).

In its first season, *Stranger Things* introduces viewers to an enigmatic girl known only as Eleven. As the story unfolds, it is revealed that Eleven has been held captive and experimented on since her birth by a mysterious government agency because of her extraordinary psychic abilities.

While all of Eleven's powers are quite impressive, her true value to her captors lies in her talent for *remote viewing*, a term coined by physicist Harold Puthoff (Nickell 2001) that is defined as "the ability to perceive places, persons, and actions that are not within the range of the senses" (Carroll 2003, 331). At various points in the show, Eleven enters a trance-like state (usually involving some form of sensory deprivation as part of the process) that allows her mind to travel to other places and ultimately into another dimension known as the Upside Down.

From our modern perspective, the notion that the government would dedicate time and resources to studying something as obscure and arcane as remote viewing might seem like a plot from a B-grade movie. However, fanciful as it may appear, this concept mirrors real-life Cold War–era experiments in psychic research, which ground the show's fantasy in actual historical events.

The Stargate Project

In 1971, the book *Psychic Discoveries behind the Iron Curtain* raised alarms by documenting the Soviet Union's supposed breakthroughs in psychic research. According to the authors, the Soviets had made significant progress studying psychic phenomena, including extrasensory perception (ESP), a field that had been relatively "ignored by Western science" (Ostrander and Schroeder 1971, xix). Fearing that the Soviets might already be using psychics for espionage, the publication prompted the U.S. intelligence community to begin investigating the potential military and strategic implications of psychic abilities for national security (Nickell 2001).

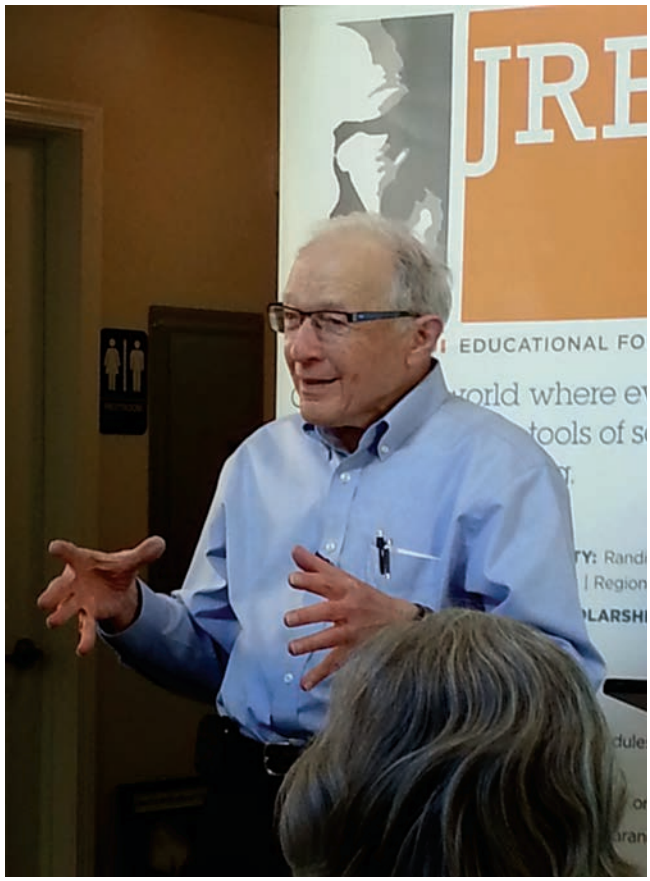
Mark Mansfield, a spokesperson for the Central Intelligence Agency (CIA), confirmed the existence of a program that the agency funded to explore psychic abilities (Associated Press 1995; Carroll 2003, 332). However, Mansfield went on to say that "although the CIA first sponsored research on the program in the 1970s," it was "found to be 'unpromising'" (Associated Press 1995; Carroll 2003, 332), and by the late 1970s, the CIA abandoned the project entirely (Hyman 1996, 21). However, the program did not end there. Eventually, control of the project was transferred to the Defense Intelligence Agency (DIA), which rebranded the effort as the "Stargate Project."

Much like the fictional lab in Hawkins, one of the alleged abilities studied by the Stargate Project was that of remote viewing. "The CIA and the U.S. Army thought enough of remote viewing to spend millions of taxpayers' dollars in research" (Carroll 2003, 332) for operations that included "trying to hunt down Gadhafi before the 1986 U.S. bombing of Libya, locate kidnapped Brig. Gen. James L. Dozier in Italy" in 1981 (Associated Press 1995), and find a missing airplane in Africa (Carroll 2003, 332; Garvin 2017).

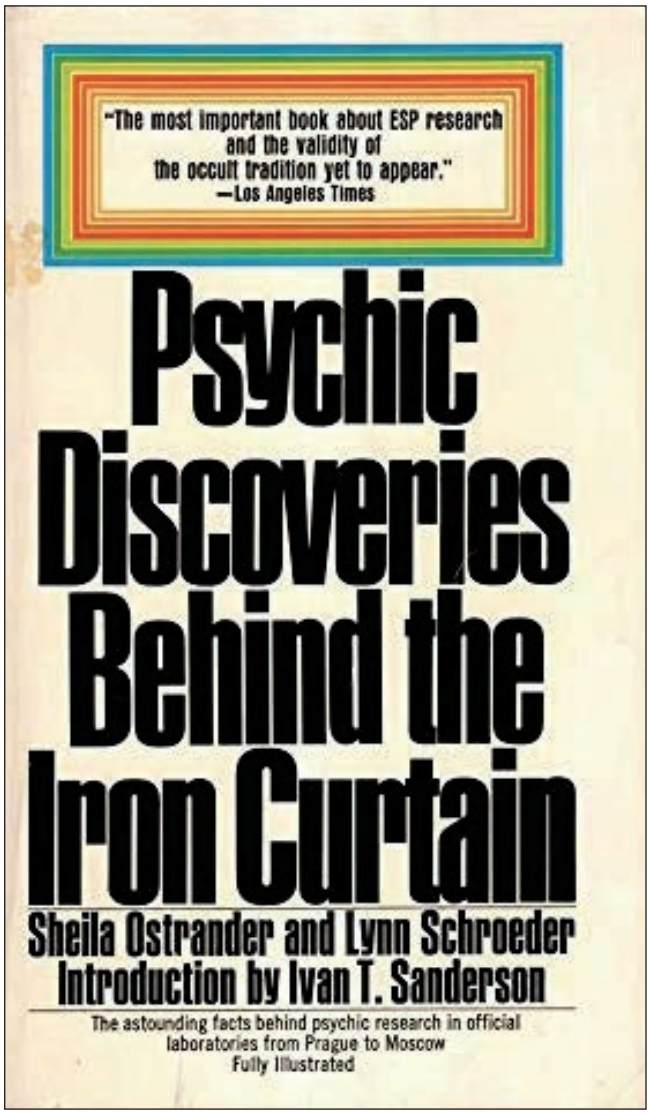
The Stargate Project operated with three main objectives: First, the program monitored the psychic research programs of other nations and their efforts in psychic warfare and intelligence gathering. The second objective was to provide a team of trained remote viewers (like Eleven) who could be called upon by any government agency needing assistance gathering intelligence. The third component of the project involved continuing the research into psychic phenomena that was conducted prior to the program's transfer to the DIA (Hyman 1996, 22).

The research continued until the project's declassification in 1995 (Hyman 1996, 22). The final blow may have been dealt by Ray Hyman, psychologist and CSICOP cofounder, who was brought in to conduct an outside evaluation (see the March/April 1996 issue of SI for Hyman's evaluation).

While it lacked the nefarious elements of the lab in Hawkins, the Stargate Project stands as a real-world analogue to its fictional counterpart. Though it never opened portals to other dimensions or unleashed monsters from the Upside Down, the program's activities occupied a strange space between science and the paranormal. Fueled by Cold War anxieties,



Ray Hyman speaking at the Los Angeles headquarters of the JREF in 2013. Credit: KoKoCorvid | Wikipedia


"The most important book about ESP research and the validity of the occult tradition yet to appear."
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Psychic Discoveries Behind the Iron Curtain
Sheila Ostrander and Lynn Schroeder
Introduction by Ivan T. Sanderson
The astounding facts behind psychic research in official laboratories from Prague to Moscow
Fully Illustrated

curiosity, and ambition, the project shows the extraordinarily tenuous lengths to which governments can sometimes go in their pursuit of power.

Project Alpha

The Stargate Project was not the only program investigating psychic phenomena during this period. Moreover, like Dr. Brenner's lab in *Stranger Things*, this particular laboratory was interested in exploring the allegedly psychic abilities of certain young people. However, in this story, there was a twist; the researchers themselves became the subjects of investigation when famed skeptic and paranormal investigator James Randi, along with two young confederates, revealed just how easily even trained scientists could be deceived.

In 1979, the McDonnell Laboratory for Psychical Research was established at Washington University in St. Louis, Missouri, thanks to a $500,000 grant from paranormal enthusiast and McDonnell-Douglas Aircraft board chairman James S. McDonnell (Randi 1983a, 24). The laboratory, under the direction of physics professor Peter R. Phillips, aimed to investigate the existence of psychic abilities through controlled experimentation and observation. Phillips and his group were particularly interested in children who could allegedly bend metal objects using only the power of their mind (Randi 1983a, 25).

Seeing an opportunity to test the scientific rigor of such research, Randi (also a cofounder of CSICOP) teamed up with two young amateur magicians who had independently reached out to him. Steve Shaw (an eighteen-year-old who later became known as Banachek) and Michael Edwards (a seventeen-year-old) contacted the McDonnell Laboratory and were eventually selected from over 300 applicants (Randi 1983a, 25). Unaware of their true identities or Randi's involvement, the researchers began testing the boys' supposed abilities, assuming nothing was amiss.

For three years, the young men amazed researchers by appearing to bend metal rods and spoons, influence electronic equipment, divine the contents of sealed envelopes, and manipulate objects inside supposedly sealed and secure containers (Randi 1983a, 26–31). While not as gifted as Eleven in *Stranger Things*, Shaw's and Edwards's apparent abilities impressed the researchers, convincing them that they were witnessing genuine psychic phenomena. The researchers had no idea they were being deceived by carefully executed sleight of hand, misdirection, and general chicanery.

From the very beginning of the study, Randi attempted to warn Phillips about the vulnerabilities of the program's experimental design and offered many specific suggestions that could have prevented subjects from deceiving the research team. For example, Randi suggested implementing strict controls on subjects, restricting their access to test materials, and taking measures to ensure that the subjects could not influence the testing conditions in any way. At one point, Randi even volunteered to be a consultant for the project at no cost (Randi 1983a, 26). Despite his efforts, his suggestions were ignored, and the lab continued to give Shaw and Edwards relatively free rein over the researchers' processes, allowing them to manipulate testing conditions to meet their own needs (Randi 1983a, 26). As a result, the scientists became convinced that the youths' powers were genuine and that they had abilities far beyond the norm (Randi 1983a, 31).

The study progressed, and the boys continued to amaze

PODCAST PICK

Listen to season 3 of *The World's Greatest Con* podcast to hear the Project Alpha story as told from the perspective of Steven Shaw (a.k.a. Banachek) and Michael Edwards.

the researchers. At some point, however, it had to come to an end. In July 1981, Randi "leaked" hints of the existence of Project Alpha during a magician's conference in Pittsburgh, Pennsylvania (Randi 1983a, 32). According to Randi, Phillips had finally reached out to him for the first time just prior to the conference and asked for his assistance. Randi said Phillips had requested that he provide a videotape of fake psychokinetic metal bending being performed and asked that Randi explain how such feats might be accomplished (Randi 1983a, 32). Randi readily provided Phillips with the tape, and although shaken by Randi's explanations, Phillips took the information to heart (Randi 1983a, 33).

Following their conversation, Phillips implemented significant changes to the research program's testing protocols. Shaw and Edwards soon discovered that, under the new conditions, they were "unable to use simple trickery" to replicate their earlier feats (Randi 1983b, 36). Testing continued for a time, and the McDonnell research group gradually reassessed its findings. Ultimately, the researchers "essentially recovered themselves by reversing rather positive convictions they'd previously held" (Randi 1983b, 44–45).

In 1983, Randi revealed the details of the hoax in a two-part article for Skeptical Inquirer. While some critics argued that the deception was unethical (Truzzi 1987, 76), Randi maintained that the experiment was necessary to improve testing protocols for this type of experiment (Randi 1983b, 45). Today, Project Alpha reminds us of just how easily everyone, even highly trained scientists, can fall victim to their own biases.

The Satanic Panic

Secret government programs and scientific research into the paranormal were not the only elements that *Stranger Things* drew upon from life in the 1980s. While it was undoubtedly a time of exploration of human potential, it was also an era marked by widespread paranoia and moral panic fueled by the fear of the unknown. In this case, however, the source of fear did not come from a shadowy government agency or a laboratory research project but rather from what some perceived as coming directly from the Devil himself.

In the first scene of episode one of *Stranger Things*, we see the characters Mike, Will, Lucas, and Dustin playing a spirited game of Dungeons & Dragons (D&D). Throughout the series, D&D remains a central point of reference, with the characters using its lore and language to make sense of the strange and supernatural events around them. Continuing to incorporate elements of real historical events from the 1980s, the show also references the public backlash against role-playing games that occurred during that time. While some believed that the game was simply a game, others felt that it taught "sorcery and voodoo and [was] a demonic, occult, pagan, witch-loving game of the devil" (Weldon and Bjornstad 1984, 22). It was this latter group that was the driving force behind what has now become known as the Satanic Panic.

The Satanic Panic of the 1980s and 1990s was a time of widespread fear in the United States, marked by the belief that Satan-worshiping cults were infiltrating American society. Not only was there concern that people, especially youth, were being targeted and tempted by evil, but people

also worried that some children were suffering physical and sexual abuse, and even being murdered, all in the service of Satan. While certain events contributed to its start, the panic was the result of sensational media coverage that exaggerated conspiracy theories and fueled public fears across the country for over a decade.

The key event that began the panic was the 1980 publication of *Michelle Remembers*, a book about Satanic ritual abuse (SRA), coauthored by Canadian psychiatrist Lawrence Pazder and his patient Michelle Smith. The book claimed to document Michelle's recovered memories of her childhood abuse at the hands of a Satanic cult. Initially, the "book was published as fact" but was later "shown to be a hoax by at least three independent investigators" (Carroll 2003, 348). Despite its lack of credible evidence, the media widely promoted *Michelle Remembers*, and shows such as *Geraldo*, *60 Minutes*, *20/20*, *Donahue*, and *The Sally Jessy Raphael Show* all dedicated episodes to alleged SRA activity (Ley 2014). In fact, "In 1989, almost ten years after the publication of *Michelle Remembers*, Oprah Winfrey featured Smith as a guest on her show," where Winfrey presented her story as an "incontrovertible fact" (Shewan 2015). In short, the book had a profound influence on what the Satanic Panic was to become. As one author noted, the book "*Michelle Remembers* was the patient zero in causing the panic" (Higgins 2024).

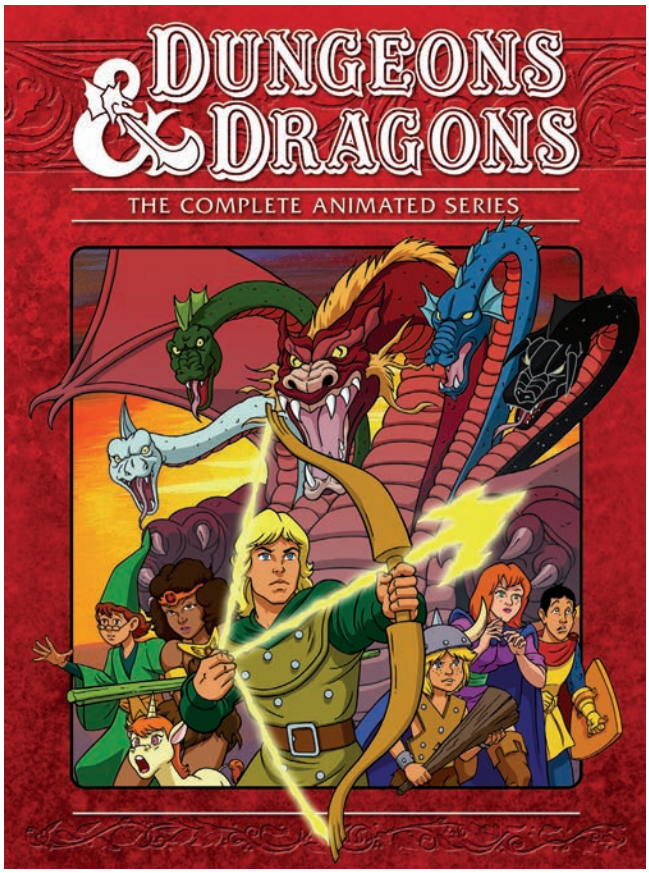
One of the more widely publicized events related to the Satanic Panic was that of the McMartin Preschool in Manhattan Beach, California. In 1983, a parent accused a teacher at the school of sexually abusing her child, leading to a massive investigation that led to claims of sexual abuse involving dozens of small children (Haberman 2014). As time went on, the accusations grew increasingly bizarre. Allegations included stories of sacrificing a baby in a church, making children drink the baby's blood, and people dressing up as witches and flying (Haberman 2014). Although little evidence was ever found and the claims were discredited, the case lasted seven years, becoming one of the most protracted and expensive criminal trials in American history at that time (Haberman 2014). Ultimately, all the charges against the accused were dropped or resulted in acquittals (Yuhas 2021). Despite this, it is clear that the case had a lasting impact that added credence to the fear that Satanic cults were targeting children in schools and daycares across the country (Haberman 2014).

More germane to the Satanic Panic as it relates to D&D (and thereby *Stranger Things*) is the case of James Dallas Egbert III. In 1979, Egbert disappeared after leaving a suicide note while attending Michigan State University. Police began to search for the young man, but to expedite the investigation into their son's disappearance, Egbert's parents hired private investigator William Dear. Eventually, Egbert was found alive, hiding in the university's utility tunnels. Dear speculated (with only scant evidence) that it was Egbert's interest in D&D that had contributed to his emotional struggles. The media sensationalized the story and thus began the idea that role-playing games could lead young people down dark and dangerous paths (Brownfield 2019). The Egbert case inspired fictional retellings, most notably *Mazes and Monsters*, which was first published as a novel and then later adapted into a 1982 television film featuring a young Tom Hanks in one of his earliest major roles ("The Great 1980s" 2014; Brownfield 2019).

Another significant event that contributed to the widespread demonization of D&D took place in Virginia in 1982. That year a high school student, Irving Lee Pulling II, tragically took his own life. Convinced that her son's involvement with D&D had played a role in his death, the boy's mother, Patricia Pulling, filed a lawsuit against the game's publisher, TSR. The case was ultimately dismissed ("The Great 1980s" 2014).

Although she lost the lawsuit, Pulling did not back down. In 1993, she founded Bothered About Dungeons and Dragons (B.A.D.D.), a group focused on warning parents, police, and educators about what she believed were the dangers of the game ("The Great 1980s" 2014). She teamed up with psychiatrist Thomas Radecki, whose professional status gave her campaign added credibility. Backed by conservative Christian organizations, B.A.D.D. circulated pamphlets and guides, urging law enforcement and schools to treat D&D not as a hobby but as a threat to kids' mental and spiritual health (Ley 2014). Indeed, the war against Dungeons & Dragons was afoot.

For a while, it was the perfect storm of paranoia, misinformation, and sensationalism. However, by the early 1990s, skepticism about the Satanic Panic began to grow, and the



foundations upon which the panic was built began to crumble. As previously mentioned, three independent investigators concluded that *Michelle Remembers* was a hoax (Carroll 2003, 348). In the McMartin Preschool case, all defendants were either acquitted, or it was concluded that "it was impossible to determine the truth [about the incidents] from the children's testimony" (Yuhas 2021). A second action brought against the school's employees ended in a mistrial, and after spending $15 million, prosecutors dropped the case entirely (Yuhas 2021).

Empirical research also helped undermine key claims made by the panic-mongers. Studies on role-playing games found that there was "no measurable negative impact on psychological functioning" (Ley 2014) among those who played them. The leadership of B.A.D.D. was eventually "shown to have exaggerated their credentials" and to have been "cherry-picking their data" to support their spurious claims (Ley 2014). Radecki, the psychiatrist who "claimed that D&D warped the morals of vulnerable adolescents," was arrested in 2013 for "trading Suboxone for sex" (Ley 2014), undermining his credibility as an arbiter of moral fitness.

By the time the panic faded, "nearly 200 people were charged with crimes," and "dozens were convicted." Many of those convictions were later overturned, though often years too late (Yuhas 2021). What about the belief that D&D contributed to suicidality? "Studies by the American Association of Suicidology, the U.S. Centers for Disease Control and Health and Welfare Canada all found no causal link between D&D and suicide" ("The Great 1980s" 2014). In the end, through evidence and reason, the panic unraveled, revealing that it was never the dark forces of Hell at work but simply humanity's tendency to fear what we do not understand.

Back in Hawkins

Thus, we now turn to the final chapter—season five—of the story in Hawkins. Will Eleven and her friends triumph over Vecna and the darkness of the Upside Down? While I have no precognitive abilities, I predict they will, though time will tell. In the end, a great story has been told.

While *Stranger Things* is filled with fantastic tales and incredible story arcs, it also holds a mirror to the world that inspired it. The seeds of reality from which the show's storylines grow remind us that the world in which we live today is not so different from that of the 1980s. Today, instead of secret government research into remote viewing, we spend money on congressional hearings on unidentified anomalous phenomena (UAP) and the risks they may pose to national security—hearings that seem more shaped by personal biases than by evidence. We live in a time when a single spark of conspiracy, such as those spread by QAnon, could just as easily ignite into a modern-day version of the Satanic Panic under the right circumstances. Indeed, our worlds are not so far removed at all.

In the end, *Stranger Things* is more than a nostalgic supernatural thriller; it is a reflection of who we are and who we have been. As the story of Hawkins comes to an end, let us appreciate it for what it is—but also remember that sometimes our reality can be just as strange as fiction. ■

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A Closer Look at *Encounters* and the Ariel School Sighting

Netflix's Spielberg-adjacent docuseries *Encounters* spotlights the ridicule and stigma that surround the topic of UFOs and alien visitation. Ironically, in doing so, it makes several errors of omission that demonstrate many of the reasons people are skeptical of alien encounter claims to begin with.

GIDEON REID

The second episode of the Netflix docuseries *Encounters* ("Believers") features the mass UFO sighting and close encounter of the third kind alleged to have occurred at Ariel School in Zimbabwe on September 16, 1994. We hear the familiar description from some of the now-adult witnesses of seeing a glinting light beyond their playground, which some children believed was a spaceship, and of a strange figure with large black eyes others believed was an alien. The absent teachers, who were inside at the time, didn't believe them, nor did some of their parents.

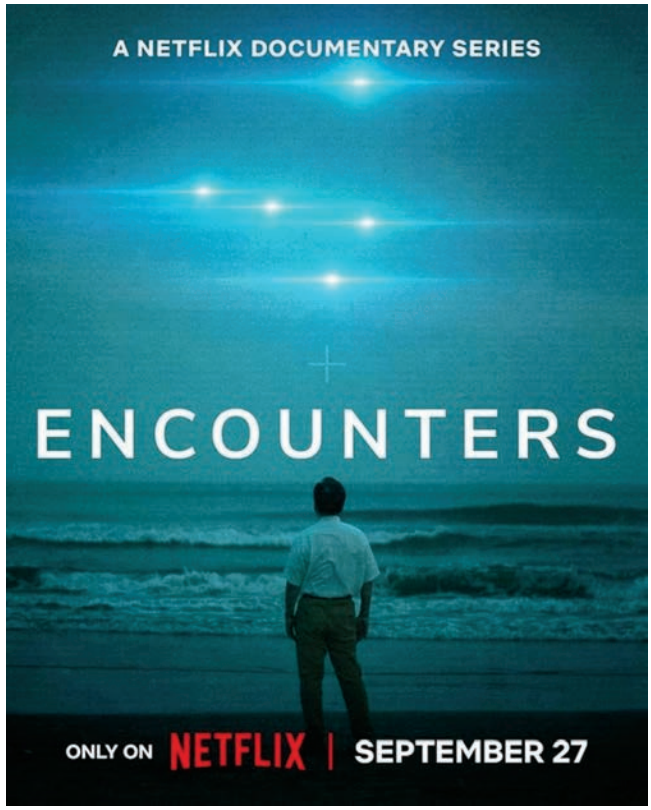
Archival clips of some of the children describing what they saw are intercut. They're bright-eyed and utterly compelling.

Then we're introduced to a new antagonist, a former pupil who appears to ridicule the whole thing. He claims there was no spaceship (it was a shiny rock) and no alien (it was made-up). The other witnesses, he says, are wrapped up in their own "bullshit" and might even be lying.

Enter Dr. John E. Mack, superstar Harvard professor of child psychiatry, Pulitzer Prize winner, and believer-in-chief. Five months earlier, he'd released his book, which featured case studies of thirteen of the most ridiculed people in UFOlogy—supposed alien abductees (Mack 1994). His sympathetic ear, we are told, was responsible for literally saving the lives of such doubted witnesses to extraordinary occurrences. He visits Ariel School and talks with some of the children whose compelling video-taped interviews many of us have seen on the internet. (Except not quite—but more on that later.)

We're offered other riffs on the stigma theme and the claim that it hinders proper inquiry into anomalous experiences. Journalist Ralph Blumenthal boasts about how his much criticized (see, for example, Greenstreet and Farley 2023) 2017 *New York Times* article (Blumenthal et al. 2017) thrust the topic into the mainstream media spotlight. We hear a new revelation from the headmistress of the Catholic Ariel School about aliens who appeared three times in the night inviting her to go with them. She declined, favoring her vocation to the school. We see a clip of Oprah Winfrey in 1994 shrugging in disbelief at the story of a supposed alien abductee on her stage.

It's all very neatly juxtaposed, and the message conveyed by the show is that UFO stigma could be neutralized if there were simply more believers.



But this misses the target of the stigma and ridicule surrounding supposed alien encounters. It's not the claim that aliens are visiting in their spaceships itself; rather, the narrow reporting of the data is subject to ridicule. That's where this retelling of the Ariel School encounter falls short in a familiar way.

Report Everything

In his Caltech commencement address in 1974 titled "Cargo Cult Science" (Feynman 1999), Nobel prize–winning physicist Richard Feynman criticized pseudoscience and reminded the graduates what proper scientific investigation must include. They must not fool themselves by making claims based

on incomplete or selected data. Science, he said, demands "utter honesty" in its reporting:

> If you make a theory, for example, and advertise it, or put it out, then you must also put down all the facts that disagree with it, as well as those that agree with it … You should report everything, including details that could throw doubt on your interpretation … The idea is to try to give all of the information to help others to judge the value of your contribution; not just the information that leads to judgement in one particular direction or another.

While *Encounters* may be classified as entertainment television, it still has the responsibility of providing context for an uninformed audience—but it doesn't lay out all the facts. There are details it has omitted that throw doubt on the story's interpretation as one of alien visitation. If we base our belief on the evidence it provides, *we* are being fooled.

Cynthia Hind

The most notable omission is that of another researcher, Cynthia Hind, who also believed the children saw aliens and who was the first to speak with them. Bizarrely, her name is not even mentioned.

Hind had an impressive background serving as the director of an industrial manufacturing company for over twenty years (Hind 1991). As a member of the South African Women's Air Force and wife of a Royal Air Force pilot, she brought technical knowledge to her role. Relocating to Rhodesia (now Zimbabwe) in the 1970s, she became a prominent figure in UFO circles, attending conferences worldwide and establishing herself as the go-to UFO expert in Africa. She became a pamphleteer issuing her own magazine, *UFO Afrinews.* Through it and her speaking engagements, where she would reveal details about flying saucers and alien abduction, including at school science clubs (Hind 1993), she was determined to "'spread the word' about UFOs" (Hind 1992, 40). Her mission was to dispel superstitions about spirits and demons among native Africans and promote what she considered a more sophisticated understanding of technologically superior extraterrestrial visitors.

She evangelized to remove stigma from the topic and was very wary of ridicule, so it's ironic that in a show about stigma, they left her out completely.

When the Ariel School event happened and Tim Leach, a BBC cameraman—whose name is also excised from *Encounters*—heard about it, Hind was the first person he called. She spoke to some of the children by telephone the day after the sighting and accompanied Leach the following week to interview around a dozen of the children at the school (Hind 1994b, 6). Hind had recommended Dr. Mack, whom she had met at a UFO conference the previous year, be contacted (Hind 1994a, 1).

Hind had collected numerous eyewitness accounts of the lights seen in the sky over South Africa earlier that week. This was identified in the British press[1] before the sighting at Ariel

Cynthia Hind in 1987. Video still courtesy of the National Archives.

School as the atmospheric reentry of a Russian rocket body. It had caused quite a stir. Hind knew of this, but because the accounts of what appeared to some as a UFO were sincere, she concluded that there was a Russian rocket and *also* an alien spacecraft watching over it (Hind 1996, 221). This dubious link has persisted in the Ariel School story and is repeated at the start of *Encounters*.

It is possible Hind was not included because video of her questioning the Ariel School children, none of which is included in the episode, has been available on YouTube for years and has been roundly criticized for its poor methodology. Hind impatiently interviewed them in groups where conformity can easily occur, frequently interrupting and not allowing them the chance to freely recall their experience. She also contaminated their responses by introducing suggestions, such as her comment to one girl that the clothes worn by one of the figures were like a "diving suit"—a recurring motif in testimonies of UFO occupant encounters.

Instead, *Encounters* centers Mack in the story, with his more agreeable bedside manner, his telegenic fame, and likely out of reverence to his memory because of his tragic untimely death a decade later in 2004.

However, any show centering Mack in its discussion of the Ariel School case should report all the facts. It has to grapple with the idea that Mack's involvement might be the reason, as our antagonist said, the witnesses remain caught up in their "bullshit."

1. BBC Ceefax ran the story identifying the rocket on Thursday, September 15, 1994. Their source was Geoffrey Perry, MBE, of The Kettering Group, a UK-based organization that was known for tracking Soviet military space vehicles using unclassified listening equipment. Additionally, a single-sentence article ran on p. 13 of *The Daily Telegraph* newspaper in London on September 16 (the same day as the Ariel School sighting).

As with other recent retellings of the Ariel School story, it becomes a vehicle by which to talk about Mack's dispute with Harvard. We hear how Mack was a pioneer in the study of a "disreputable" subject matter of alien abduction and that Harvard took issue with this. However, this is not accurate, and it's a crucial detail omitted from the story. It was *the lack of transparency about his research methods* that imperiled his Harvard tenure, not the subject matter of his research.

Yet, in this revision of history, these details don't appear to matter.

It also seems irrelevant that Mack arrived two-and-a-half months later, after the children had recalled their sighting for numerous TV outlets. Nor is it deemed significant that the purpose of his visit to Africa was to find cases of alien abduction outside the United States—a phenomenon that the demographic data showed was limited to mostly white North Americans. He didn't find any evidence of this at Ariel School. Although he probed the possibility with questions to one girl, asking, "Did you go with him [the alien], do you think?" (Nickerson 2022, 44:33).

Crucially, it doesn't appear to matter that Mack's interviews have only ever been shown publicly as short, edited clips, with the most compelling parts being the hints of telepathic communication between the aliens and the children.

What's also unaddressed is that we've not heard the whole conversation Mack and his research assistant had with the children. There are clues that Mack discussed his book about alien abduction with the interviewees. Any parent or child who'd obtained a copy of it before they were interviewed would quickly get the gist of what aliens do when they meet humans, i.e., offer telepathic warnings of ecological disaster.

In the closing captions of the episode of *Encounters*, we're reminded that "sixty-two kids reported seeing spaceships and aliens." So why did Mack interview only twelve children (the same number as Hind)? Clips from only seven of those interviews have been made publicly available. The archive footage and voice recordings were donated to Rice University's Archives of the Impossible in 2023 yet are still not available to researchers. Only three of them said anything about receiving a message from the aliens. The remaining 180 or so children who didn't see anything at all are ignored or forgotten. Their testimony is no less important simply because they claim that nothing happened; that, also, is relevant information that must be considered.

There are over 100 pages of interview transcripts (Blumenthal 2021) and hours of video (Matchan 2009) and audio from Mack's Ariel School interviews, yet for years mostly the same selected snippets have been used to tell the story. With Ariel School, it's as if the (clearly honest) testimony of children has inoculated the event against scrutiny. The possibility that they accurately reported what they actually saw, yet—due to the flap surrounding the Russian rocket—misinterpreted it as aliens and their spacecraft is overlooked.

Pushback to such reasonable thinking can be hysterical: Those children are not *lying*! A *Harvard* professor interviewed them! What more *evidence* could you possibly need?"

Well … *all* of it, please.

Prior Surveys on Nuclear War

Anyone new to the Ariel School story, relying solely on *Encounters* for their opinion, might view it differently knowing a little of Mack's prior work in the 1980s, when he surveyed children's sentiment toward nuclear war (Goodman et al. 1983; Mack 1982). Mack was deeply opposed to nukes, protested against their creation, and wrote frankly about what he said was disinformation from the U.S. government (i.e., they are lying about their ability to protect their citizens in the event of nuclear war; Mack 1985a).

The children he surveyed worried about technology and reported harrowing dreams of apocalyptic scenes, remarkably similar to the supposed telepathic message received by the Ariel School children—a message no child reported before Mack's arrival. One girl at Ariel School famously told Mack that the aliens told her that "We mustn't get too technologied."

Mack also brought his transpersonal worldview to Ariel School. In the year before, he wrote about how the materialist worldview, with its over-reliance on technology, will lead to our self-driven extinction:

> By restricting the scope of reality and the domain of personal fulfilment to the physical world, while excluding from consciousness the power of spiritual realms, human beings are ravishing the earth and massacring one another with instruments of ever greater technological sophistication in the quest for power, dominance, and material satisfaction. The outcome of the continued enactment of this view will be the breakdown of the earth's living systems and the termination of human life as we know it. (Walsh and Vaughan 1993)

The Hypnosis Omission

Mack's use of hypnosis in his research also gets no mention in *Encounters*. All thirteen of his alien abduction subjects recalled their experience with the aid of hypnosis, which he believed was a trance state "more reliable" than the waking state (Mack 1994, 67). Yet he euphemized the term *hypnosis*. He preferred *relaxation sessions* or *Grof breathwork* and justified its use on children in his research into supposed alien abduction.

Needless to say, this is controversial. While hypnosis has demonstrated benefits in alleviating anxieties, fears, or bad habits in children, practitioners caution against its use for the recovery of memories due to the potential for distortion effects. The challenge for therapists being that neither they nor the subject are able to disentangle a genuine memory from a false one, complicating the treatment of maladies. Some experts note that children, in particular, can slip into hypnosis in a "naturalistic" way (Erickson 1958) or when spoken to with a "sensitive modulation of tones and tempo" (Kohen 1986)—arguably just the kind of hypnotic situation created in Mack's Ariel School interviews with the children.

Public Deceit Revealed

A notable irony in *Encounters* is the repetition of a statement by Mack's biographer, Blumenthal, who quotes Mack as saying: "This is what I do. I'm a psychiatrist. I talk to people all the time. I kinda judge when they're telling me the truth and when they're, you know, not, making up a story."

Anyone who knows anything about Mack will know he had just failed such a test of his judgment. In the same week he published his book *Abduction: Human Encounters With Aliens*, he faced public ridicule in *Time* magazine (Willwerth 1994) and the *Boston Globe* for failing to determine if journalist Donna Bassett was genuine or someone making up an abduction story that involved seeing President Kennedy and Khrushchev on board a UFO. This story even made it to Zimbabwe's press months before his arrival in Zimbabwe (Klass 1994).

After the deceit was made public, Bassett was quoted by *The Globe*:

> This isn't about UFOs … This is a way to hide human experimentation that's been undertaken for a personal political agenda. That agenda, contends Bassett, is reflected in the message Mack claims to have distilled from patients' encounters with aliens: that the planet is threatened by ecological destruction, that earthlings must wake up before the destruction goes too far. (Kahn 1994)

Mack described his interviews as "a co-creative intuitive process" with the "flowing together of consciousness of the two (or more) people in the room" (Mack 1994, 391). To more skeptical ears, this sounds very much like an admission of suggestion and distortion.

Being relatively new to the UFO and aliens topic, introduced to it by artist and alien abduction research pioneer Budd Hopkins in 1989, one may question whether with the combination of already established UFO lore about so-called "contactees" receiving messages from aliens warning humanity against nuclear weapon use gave him the opportunity to leave the Ariel School children with a positive environmental message. Was it an irresistible means for Mack to achieve his deep-seated desire to wake us up to the "severe mental illness" of nuclear weapons proliferation (Mack 1985b) and actually nothing to do with UFOs?

Mack had already weathered the storm of criticism for encouraging his subjects, who may have had some undiagnosed disorder, in their belief they had been selected by aliens for cosmic reeducation. He believed this had caused them no harm. So, would it be just as harmless to allow some children to believe that benevolent aliens are imploring us to look after our planet?

In an editorial titled "Nuclear Weapons and the Dark Side of Humankind" (Mack 1986), written before his interest in aliens, he pondered how his academic field could participate in changing the societal awareness about our precarious situation with nuclear weapons: "Psychologists, psychiatrists and psychoanalysts are exploring new ways of achieving this awareness and are participating increasingly in the political process itself."

Reading this, one can't help but wonder if Bassett's comment about "human experimentation" might have been correct. If invoking aliens to get the message across was an effective new way of achieving awareness, then so be it.

***

The *Encounters* episode encapsulates many of the problems that plague UFOlogy. Dr. Mack's credentials and fame undoubtedly brought intense media coverage to the topic and reduced the stigma for those making extraordinary claims. However, it also set a trend of appealing to authority, whether that be a Harvard professor then or former intelligence officer today, allowing evidence-free testimony to go unchallenged.

Comparing the Ariel School story with today's conversation about UFO disclosure reveals a double standard. Passionate appeals are made for data to be released by the U.S. government that might be evidence of world-changing discovery. Yet with Ariel School, there's apparent satisfaction with incomplete data. There appears to be little curiosity about the Russian rocket or the entire conversations Mack had with the pupils he interviewed, and there is no consideration of prosaic explanations for what the children saw.

The stigma and ridicule that once surrounded extraordinary claims about UFOs and aliens has become a stigma against those asking for data. Journalists such as Steven Greenstreet and investigator Mick West can attest to numerous examples where those claiming evidence of extraordinary things object angrily to being asked for supporting data.

A shared element between Ariel School and Mack's work on abduction is Mack's conviction that his subjects were sincerely describing something authentic. Critics pointed to the unproven concept of repressed memory (Loftus and Ketcham 1996), hypnosis's problems of distortion, cultural influences such as science fiction, and their diffusion through interpersonal and mass media channels. Because the children at Ariel School are clearly sincere in their responses and no reasonable person would believe they are lying, a similar reasoning is applied: what they described must be real. But what if their recollections are correct but they were misperceiving a mundane stimulus? This unexplored aspect of the Ariel School story deserves attention, and it's unfortunate it wasn't addressed in the episode. ■

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Count Dante, Dim Mak, and the Kung Fu Death Touch

PETER HUSTON

Arguably both a legend and an embarrassment in the martial arts world, "Count Rafael Dante," the self-proclaimed "world's deadliest man," is best known today for flashy comic book ads hawking a mail order booklet that promises readers will "fear no man" and learn "Dim Mak, the kung fu death touch."

Born in 1939 as John Timothy Keehan, the son of a prominent Chicago-area, Irish American bank president, he eschewed a normal career path. His life was marked by problems with authority, eccentric behavior, and the pursuit of martial arts study and violence. In 1967, he adopted the Count Dante persona: he dyed, groomed, and trimmed his hair and beard immaculately and offered a completely fictional biography. His background, he claimed, included descent from Spanish royalty. He claimed violent adventures and amazing accomplishments in "the Far East," such as having beaten up Bruce Lee, winning multiple martial arts tournaments of all kinds, and being master of a wide variety of martial arts—which he claimed to have studied under extremely famous people. Dante claimed to have killed over fifty men by the time he was thirty-six (for an average of about two a year after the tender age of ten). He also claimed to be a hairdresser at the Playboy Mansion in Chicago.

It seems he was, in fact, a hairdresser for Playboy in Chicago, but the rest seems to be mostly fiction—perhaps made plausible by flourishes such as the chained pet lion he proudly took for walks in public. Unfortunately, the lion could not be toilet trained and also bit a politician during a photo op. Dante really was a suspect in an armored car robbery as well as a bombing of a rival martial arts school. He also led his students on an attack on a rival martial arts studio, where they charged in with swords and spears and one of his students died in the melee (Cooley with Levin 2004; Feldheim 2022).

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This is a reproduction of the original advertisement used by Count Dante to sell his martial arts training manual to the public in 1966. The World's Deadliest Fighting Secrets is still the official history and syllabus of the Black Dragon Fighting Society.

Dim Mak

Among Dante's best-known contributions to martial arts was to publicize Dim Mak, an Anglicization of the Cantonese term *dim² mak⁶* (點脈), which means "press artery." The Mandarin term is *diǎnxué* or *tian hsue* (點穴), which means "press vital points." (*Dianxue* is the pinyin romanization system and *tien hsue* is the older Wade-Giles system.) It is taught in some martial arts and is common in martial arts fiction. The idea is that through manipulation of, and attacks upon, the body's vital points (often the same points as in acupuncture), one can cause devastating damage, paralysis of limbs, death, or even a delayed death that occurs later—often days later—seemingly without explanation.

In his booklet, Dante emphasizes several principles of unarmed martial arts combat. There are sixteen of these, each listed with a letter, A through P.

Letter N states: "Familiarization with the major and lesser-known nerve centers, pressure points, blood vessels and vital organs of the body—their exact location and the time of

the day they are most vulnerable to attack" (Dante 1968). In other words, Dante claims that not only does the human body have several points that are vulnerable to attack, but the actual vulnerability of these points varies depending on the time of day. We will return to this belief later.

Letter P discusses the development of *chi* (also spelled *qi* or *ki*), vital force or the body's inner strength, an important part of medical and martial arts theories in Chinese and Chinese-influenced cultures.

Other sections emphasize the importance of timing and learning to feint, bob, weave, and roll with blows when struck, as well as learning patterns of attack and defense and so on. There is little here that most martial artists would disagree with, although it is thrown out quickly and with little explanation, depth, or instruction on how to actually achieve or develop the skills.

Vital Points and Vulnerable Targets in Dante's Booklet

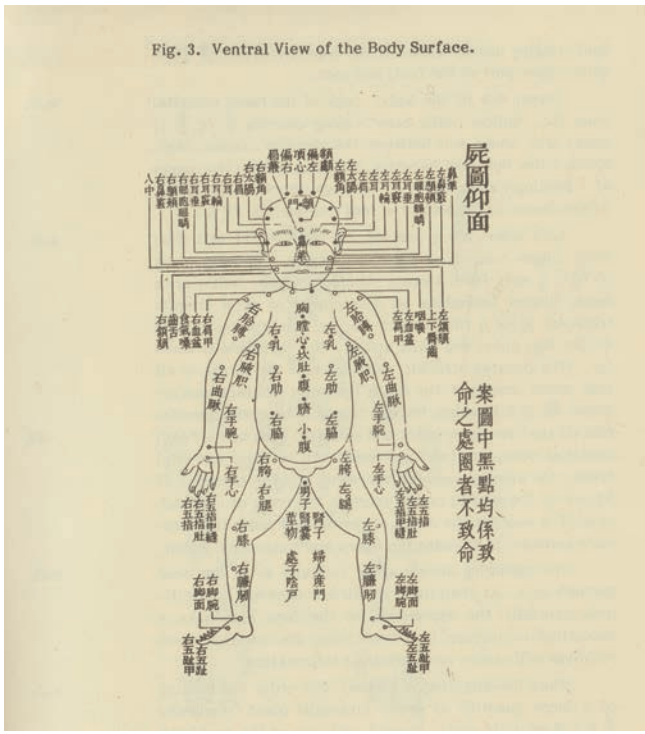
Dante's fighting system as described in the booklet has a strong emphasis on vital points and vulnerable targets. There are four charts: A, B, C, and D, diagramming 23, 18, 12, and 10 points, respectively. I find none particularly controversial, although I would question the utility or wisdom of beginning martial arts training with this.

As for Dante's description of Dim Mak, we have three charts, labeled "E–F," "E," and "F." Charts "E" and "F" are diagrams of the human body. "E" has an anterior view, and "F" has a posterior view, showing a total of twenty-four selected striking points on the human body. Chart "E–F" is a list of the same points and the best time of day to strike each point.

So, in other words, if one is in a fight between the hours of 4 a.m. and 6 a.m., according to these charts, the ideal location to strike someone is the very top of their head. This site is allegedly especially vulnerable to attack during these hours. If the fight occurs between the hours of 2 a.m. and 4 a.m., then the ideal striking point is the bridge of nose. From 1 a.m. to 2 a.m., the ideal striking point is a couple inches above the left nipple, and from 12 a.m. to 2 a.m., the ideal striking point is the point below the nose and above the lip, also known as the philtrum. According to Dante, the ideal striking point from 10 p.m. to 12 a.m. is, strangely enough, the outer edge of the left foot. Quite frankly, it's quite a strange list and strikes me as completely impractical. However, it has been reprinted (without attribution) at least once as "certified fact" (Steiner 1982).

Dante's Sources

Dante's booklet was published in 1968, when accurate information on Asian martial arts was difficult to obtain in the West; even inaccurate information on the subject was difficult to acquire. Bruce Lee had not made any martial arts movies yet, although he did play Kato on the *Green Hornet* television show. Neither the television show *Kung Fu* nor the film *Billy Jack* existed. The Shaw Brothers Studios in Hong Kong was not yet making kung fu films and instead preferred Chinese "WU XIA" sword-fighting films.



The black dots mark locations where wounds may be mortal. The circles mark nonmortal wound locations. An official could use the names from this chart in filling in the ventral view chart which was to be submitted with the inquest report. From the *Hsi yuan lu hsiang i*.

It was around this time that Dante studied under Grandmaster James Lee, who taught Shaolin Chuan Fa (Shaolin Kung Fu; Feldheim 2022, 44–45). This man reportedly taught Dim Mak, although he and Dante had a falling out following Dante's adoption of the Count Dante persona and the publication of his notorious booklet. Little is known about Grandmaster James Lee or his martial arts background today, according to Floyd Webb, who is widely recognized as an expert on the life of Dante.[1]

Examining the Claims

Looking at the two parts of this claim, the first half is that these twenty-four points are sites where the human body is especially vulnerable to damage. The second half is the claim that the vulnerability of the sites varies with the hour of the day.

Taking these one at a time, a survey of works on vital points of the human body reveals that some of the sites described are, in fact, recognized as vulnerable striking points of the human body (Adams 1985; Kubota 1985; Long 1983; Long 1991; Mashiro 1978; Quinn 1990; Quinn 1993; Tegner

1. Webb said as much in a reply to my Facebook post on the "The Search for Count Dante" page. Nemo Filipovic, a writer for the Weird Stuff website, states otherwise and says that James Lee was a double agent in World War II. I suspect he is confusing the James Lee from Chicago, about whom almost nothing seems to be known, with a James Yimm Lee from California, who also taught kung fu around this time. The Californian Lee is the subject of a Wikipedia page that says he served in World War II, although it does not say he was an espionage agent.

1968), although curiously at least one is not. (Again, what's up with that attack aimed at the side of the foot? While not a recognized target for martial arts strikes, it may represent the acupuncture point known as "gongsun," but I can't say for sure; see Chen 1982).

As for the second half of the claim that the damage done when these points are struck varies widely depending on the time of the day, a review of a wide variety of textbooks on treatment of physical injury and trauma for paramedics, EMTs, and other prehospital Emergency Medical Services personnel simply does not confirm any strong link between time of day and the effects of strikes or other kinds of physical trauma (see, for example, Caroline 2018).

Other Sources of Dim Mak Claims

Of course, Dante was not the only person to claim knowledge of Dim Mak, and his booklet is far from the only written source claiming to teach it. Countless fictional sources feature Dim Mak. These range from Chinese "Wu Xia" novels (Mok 2001), pop culture sources (see "Touch of Death" at TVTropes.org), and martial arts films. Quentin Tarantino's delightful *Kill Bill* films include a quest to learn the Five Point Palm Exploding Heart Technique from a Chinese Kung Fu Master. Like much of the film, this is an homage to classic exploitation films, in this case at least two 1970s Chinese kung fu films.

Dim Mak is widely considered real in East Asian cultures. Although information that has not been sensationalized about Dim Mak beliefs is scarce, one source is Robert W. Smith's *Chinese Boxing, Masters and Methods*, first published in 1974. Smith was a U.S. government employee stationed in Taiwan who studied martial arts on the side. He has a reputation as a reliable reporter on Chinese martial arts of the time.[2]

In this book, Smith occasionally shares conversations with teachers and students about "dim mak" ("tien hsueh"). Although details varied, Smith reports that the time of day was believed important. "Tien Hsueh holds that in the mid-morning the most vulnerable target is the head; at mid-day the upper torso; in the afternoon, from the navel to the knees; and in the evening, below the knees" (Smith 1974, 9). A different teacher taught that "Tien Hsueh" involved 365 vital points; thirty-six of these were suited for striking and twenty-four for "shutting," and the attack, a one fingered poke, should be chosen based on twelve two-hour periods of the day. This system is based on correlations with the twelve branches, the same system used in the cycle of twelve Chinese years in the traditional calendar (Needham 1956, 358).

Smith wrote: "Sometimes a victim of the 'small hand' method would be touched and die later. After a touch on a vital point, no medicine could remedy. A person could die from a hit to the genitals in three days" (Smith 1974, 15). Dante's description is notably simpler.

2. Except when he used the penname John F. Gilbey. Under this name, he wrote two books of "martial arts tall tales" that are often marketed as nonfiction, something that confused me years ago when I read them, and a book on the sport of boxing that is reportedly good and reliable reporting.

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Dim Mak and the Scientific Method

The idea of vital, vulnerable points has a long history in China, dating to at least 1247 CE during the Sung Dynasty, when such points were included in a manual for coroners, a work often described as the world's first forensics manual. Chinese civilization has produced several often coexisting methods of healing. The most popular is so-called traditional Chinese medicine,[3] the system that Paul Unschuld, prominent historian of Chinese medicine, refers to as "the medicine of systemic correspondence." It dates back to at least the second century CE, and its theories emphasize that good health depends on maintaining proper balance of both external and internal influences (Unschuld 1985). Dim Mak concepts are rooted in this system. Not only is there chi, some systems of Dim Mak also include references to yin and yang as well as the five phases (elements) of matter and other traditional cycles of correspondence, often resulting in an increasingly complicated, increasingly nonfalsifiable, untestable set of beliefs.

3. In this paper, I use the term *traditional Chinese medicine* to refer to a wide variety of writings, teachings, and practices used in China and areas where Chinese culture had influence that were based on similar ideas involving the flow of *chi* and complex systems of correlations, such as yin-yang, the five elements, the ten stems, the twelve branches, and more that form an important part of Chinese metaphysics and proto-scientific thought. The term *Traditional Chinese Medicine* (capitalized) refers to one such school of medicine created and codified by the Chinese Communist Party and taught and practiced in the People's Republic of China.

The numbers that one normally finds in Dim Mak—24, 36, 108, 365, etc.—are numerologically significant in Chinese belief. These beliefs predate the advent of the scientific method and are, like much relating to Dim Mak, nonscientific (Eberhard 1983). Nevertheless, according to legend, Zhang Sanfeng, a twelfth century martial artist and sage, not only founded Tai Chi Chuan but also improved Dim Mak through testing strikes on prisoners (Kelly 2001; Montaigue 1993; Filipovic 2014). There are, however, several problems with this.

According to historians, Zhang, a Taoist alchemist, did not actually create the art of Tai Chi Chuan (Henning 1999), and there is great controversy over the details of his life. For instance, he reportedly lived in the Song (960–1279 CE), Yuan (1279–1368 CE), or Ming Dynasty (1368–1644 CE), or maybe all three, because some sources state he lived to be 212 due to practicing Taoist longevity exercises (Walker and Bauer 2002). Others, however, give a slightly more realistic 145 years (e.g., Hsieh 1991). Scholars discuss the political ramifications of him being inserted into narratives about the Shaolin Temple in the seventeenth century, several centuries after his death (Shahar 2008).

Although he is widely credited with being the founder of Tai Chi Quan, this claim dates from 1867 CE and became widely spread in the early twentieth century by Tai Chi Quan instructors (Henning 1999; Walker and Bauer 2002). Therefore, the claim that Dim Mak was tested on prisoners in a quasi-scientific way by Zhang Sanfeng, the founder of Tai Chi Chuan, clearly dates from this period or later, notably a period of history when scientific testing was widely known and respected as a way to prove things worked.

In summary, Dim Mak, the Kung Fu Death Touch, originated as an attempt to apply prescientific Chinese thought and concepts to martial arts centuries ago. After its transmission to America, it became the subject of comic book ads thanks to an excentric hoaxster and martial artist calling himself Count Dante. ■

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How the Darwinian Revolution Is Finally Reaching Medicine

NATHAN H. LENTS AND SAMANTHA VEE

The study of human evolution has a checkered past. The field was politicized almost immediately after the first discovery of Neanderthal fossils, with European nationalism pushing each country to produce fossils establishing their importance in human evolutionary history. But there were thoughtful scientific controversies as well. The earliest generation of paleoanthropologists were blustery physicians and anatomists, largely unaware of the developing intricacies of evolutionary theory (Tattersall 2015). One result was the fallacious but deeply entrenched notion that human evolution is a process of steady improvement along a single lineage. The Modern Synthesis paradigm finally reached paleoanthropology when the great evolutionary theorist Ernst Mayr burst onto the scene to set the record straight. Their collective egos bruised, physicians largely retreated from the field, and biologists took the reins, producing one of the most vibrant and imaginative communities in science. To be sure, the bluster remains.

One unfortunate consequence of the departure of physicians from the helm of paleoanthropology is that the field of medicine has benefited very little from the fruits of evolutionary biology. There are many requirements for gaining acceptance to medical school, but a course in evolutionary biology is rarely among them. That may soon be changing; we might say that medicine is finally evolving.

What Is Evolutionary Medicine?

With roots going back several decades, the field of evolutionary medicine has hit its stride. Put simply, evolutionary medicine is the acknowledgement that the anatomy, physiology, and biochemistry of our bodies have deep evolutionary roots and were shaped and adapted to an environment very different from the current one. Therefore, key to the application of evolutionary principles to medicine is an understanding of how our ancestors actually lived, in technical language, the Environment of Evolutionary Adaptedness (EEA). Insights from this approach include simple tidbits such as how to engage our bodies in more "evolutionarily correct" postures and modes of exercise, as well as more unsettling revelations that can—and should—totally revolutionize what we eat (Stearns 2012).

While most of what evolutionary medicine can offer is

the *prevention* of disease rather than new treatments or medicines, its potential goes far beyond that. Because the disparity between our modern world and the EEA plays a role in conditions called "mismatch diseases," evolutionary thinking can actually help reverse these conditions in certain patients (Lieberman 2014). By blurring the line between treatment and prevention, this holistic approach to medicine can lead us toward sustainably improved health.

I have observed this firsthand. Like so many, my paternal grandfather developed type II diabetes late in his life and required insulin injections to control his hyperglycemia. However, after he transitioned to a long-term care facility, his blood sugar began to stabilize. Within a couple months, he was off the insulin altogether and lived the remaining three years with no sign of the chronic condition that plagued him the five years prior. What changed? Prior to submitting to managed care, he and my grandmother, in their stubborn wish to remain independent, had been subsisting almost entirely on prepackaged, highly processed foods packed with salt, sugar, and highly refined carbohydrates as fillers and thickeners. But in the nursing home, they ate freshly prepared meats, vegetables, and fruits. By switching to a diet with a more appropriate macronutrient profile, my grandfather's diabetes was reversed. Viewed another way, he stopped poisoning himself with a diet poorly matched to his needs.

Of course, evolutionary reasoning probably did not motivate the nursing home as they prepared my grandfather's meals. But appreciating the EEA can guide us in the right direction more quickly. Dietary recommendations about fat and carbohydrates are a case in point. During the "low fat craze" of the 1970s and 1980s, doctors urged us to minimize dietary fat to maintain a healthy weight. To capitalize on this craze, food producers replaced fatty ingredients with starchy ones, further boosting our already carbohydrate-rich diets. We now know that this advice was completely wrong, but we learned that lesson only after decades of frustration, and the health and longevity of millions were harmed in the process. One wonders if the current epidemic of obesity and diabetes might have been largely prevented had we listened to anthropologists all along, who had been working diligently to piece together the diets of our ancestors. The promise of evolutionary medicine is that, by appreciating our evolved physiology, we can prevent or reverse mismatch diseases.

Evolutionary principles can also serve the field of medicine by providing a theoretical framework for integrating disparate knowledge. Indeed, this was the power of the Modern Evolutionary Synthesis. Scientists working in population biology, organismal genetics, and molecular biology had been completely siloed, with their bodies of knowledge growing apart. By integrating these fields into a cohesive intellectual framework, we can understand populations, organisms, and molecules all at once. Evolutionary medicine offers the same promise for understanding how our cells and organs operate under conditions of health and disease. This reveals *ultimate* evolutionary mechanisms to complement medicine's traditional focus on the *proximate* mechanisms of disease. After all, "Nothing in biology makes sense, except in the light of evolution" (Dobzhansky 1973).

Food and Metabolic Disorders

It is becoming increasingly clear that much of the food we eat is making us unwell. However, building a full understanding of what constitutes a healthy diet takes time and research, and we should be suspicious of simple fixes. For example, popular diet fads have attempted to produce simple, easily digestible guidelines (pardon the pun) such as the so-called Paleo Diet. In some cases, these guidelines may at least be on the right track, and we must admit that, while there is little "paleo" about it, this diet *is* healthier than typical American fare, if for no other reason than it preaches a drastic reduction in sugar intake.

The reality is that there was historically no single "paleo diet" because our omnivorous ancestors migrated in and out of various climates and habitats and therefore lived on a wide variety of foods for millions of years. Coastal and island cuisines are seafood-based, while plains and steppe peoples hunt big game. Rainforest groups incorporate more fleshy fruits and roots, and so on. One of the first lessons from our understanding of pre-agricultural diets is that humans are far more flexible than any of our primate cousins in terms of what foods we can subsist on. As with other aspects of our physiology, humans are the ultimate generalists. But that does not mean that any food will do. In fact, as I wrote in *Human Errors*, humans have the most obnoxious dietary requirements of any mammal, stemming from our history of omnivory and dietary variety (Lents 2018).

The mismatch between the EEA and modern diets is not in the small details of vitamins and minerals but rather the macronutrient profiles (carbohydrates, proteins, and fats). Our ancestral diet was much higher in fiber, much lower in carbohydrates, somewhat higher in protein and antioxidants, and almost completely absent of simple sugars. We often forget that the plants and animals we now eat are the products of thousands of years of selective breeding that made them tastier and easier to cultivate. But, in essentially all cases, it made the food these organisms produce more calorific but less nutritious. And we have been stuck with this mismatched diet ever since. Geographer Jared Diamond has called farming "the worst mistake humans ever made" (Diamond 2002).

For example, wild fruits are almost completely unrecognizable and unpalatable to us today. They are much smaller, tougher, more fibrous, more bitter, and less sweet. To get the same calories found in one large domesticated apple, our ancestors had to eat dozens of small wild apples, and they acquired a lot more vitamins, minerals, and antioxidants along the way, not to mention more soluble and insoluble fiber. They also had to spend a long time chewing them. Domestication transformed these nutritious but hardy fruits into enormous, soft, fleshy treats packed with calories and barely any fiber or other nutrients.

It's even worse than that. Modern cultures around the world utilize starchy cereal crops, such as wheat, corn, rice,

millet, barley, or rye, as the base food of their cuisine. These crops are staggeringly high in carbohydrates and have minimal protein, fiber, vitamins, and other nutrients. Accordingly, most of us consume far more calories than we need, and we get 60–75 percent of those calories from carbohydrates. Foragers, on the other hand, eat far less carbohydrates. The most carb-heavy hunter-gatherers are near the equator and get nearly 40 percent of their calories from carbs, but most groups get below 25 percent, and some less than 10 percent. And to get those carbs, they consume a lot more bulk. The result is a balanced profile of macronutrients with a wide variety of different fats, proteins, and carbohydrates (Ströhle and Hahn 2011).

There is growing evidence that our poorly diversified diets create a metabolic imbalance that leads to diseases, most especially obesity and type II diabetes. One key factor is our rapid consumption of sugar, which results in wide swings in our blood sugar. In fact, medical students all over the world are taught that it is perfectly normal for our blood sugar to spike very high upon the consumption of food, followed by a surge of insulin that forces blood sugar to drop precipitously below baseline before eventually leveling off. But these wide swings in glucose and insulin are not observed when we eat a diet lower in carbohydrates and higher in protein, fat, and fiber, which proceed much more slowly through our digestive system.

The sugar roller coaster promotes the deposition of calories as stored fat, fatty liver disease, inappropriate hunger, and swings in mental alertness, fatigue, and mood. It also stresses the pancreas and, over time, leads to insulin resistance. It is therefore no surprise that those who switch to a low-carb diet report being more alert and energetic and less hungry throughout the day, even when they are in a calorie deficit. And they lose weight more easily and sustainably (Livesey et al. 2008).

Thus, perhaps the simplest and most actionable truth produced by evolutionary medicine is also the most powerful in terms of health outcomes: we should be eating more like our ancestors did. To be sure, a true "paleo diet" would be as repulsive as it is impossible to procure. How many of us want to live on worms, leaves, uncooked roots, bugs and grubs, raw bone marrow, and the occasional hunk of raw meat? But we *can* achieve similar macronutrient profiles by minimizing salt, sugar, and refined carbohydrates. This can be done by simply eating more nuts, seeds, seafood, lean meats, and, more than anything else, leafy greens and other fibrous vegetables. By combining calorie dense foods such as meat and nuts with plenty of roughage and some fruit, we slow down our digestion, avoid blood sugar spikes, and provide our bodies the right proportions of proteins, fats, fiber, and carbs.

Feeding Styles

Modern and ancient diets are not just different in terms of *what* we eat, but also *when*. Once again, previous generations of dieticians probably got their advice exactly backward when they urged us to eat smaller, more numerous meals throughout

the day. Our ancestors likely did the exact opposite, obtaining nutrition in a feast-or-famine manner. Foraging peoples tend to spend most of their time in a calorie-deficit, going all day, sometimes multiple days, with little or no intake, followed by a period of bulk consumption following a major kill or other harvest. This seems unthinkable to us now, but sporadic feast and famine was likely the normal way of things for millions of years, and our metabolism adapted accordingly (Diamond 2013).

Is it any big deal to eat more frequently than our ancestors did? More data is needed, but there is good reason to think it matters a lot. Many of our most prevalent diseases are caused or made worse by inflammation. Eating a meal raises systemic inflammation as our body puts the immune system on high alert for potential pathogens and parasites in our food (which would have been raw for most of our deep past). Eating meals more frequently, therefore, raises our baseline level of systemic inflammation and may promote the progression of inflammatory conditions, such as atherosclerosis and other cardiovascular diseases, rheumatoid arthritis, asthma, both types of diabetes, Alzheimer's disease, Crohn's disease, inflammatory bowel syndrome, and many types of cancers (Furman et al. 2019).

Once again, there is a fad diet that may have found this connection already. Intermittent fasting is a relatively new concept in dietetics, in which practitioners spend most of

their waking hours consuming little or no calories and instead consume their entire daily allocation within a few hours, usually in the late afternoon and evening. Adherents of this style of eating report weight loss, sustained physical energy and mental alertness, and improvements in certain chronic inflammatory conditions. In fact, studies have found that intermittent fasting performs as well as caloric restriction, long the gold standard, in achieving weight loss outcomes. It may be that, all this time, the major benefit of caloric restriction was not the overall reduction in intake but rather the long periods of fasting that is required to achieve that reduction. Strong conclusions like this await further research, but so far, the data on intermittent fasting is encouraging (de Cabo and Mattson 2019).

Ergonomics and Orthopedics

Evolutionary medicine may also provide orthopedic lessons. It turns out that most of us spend most of our days in postures that are not optimal for our anatomy, even if they feel comfortable. This knowledge, too, has been percolating for some time. Over ten years ago, a friend quipped to me, "Sitting is the new smoking."

Indeed, sitting in chairs may be one of the unhealthiest ways we can spend a day, and most of us do it all day, every day. Hard as it may be to imagine, our ancestors did not sit for extended periods, nor do the foragers of today. This is not because the foraging life is one of constant toil. In fact, foragers have far *more* leisure time than modern-day shift workers. However, restful postures among foragers include laying, leaning, and squatting, and when they do sit on a log or stump, it is usually not for long. Sitting for extended periods can lead to tears in the mesenteries that hold our intestines, tight hamstrings prone for a sprain, and, worst of all, atrophied postural muscles in our backs and abdomens, which promotes poor posture in any position (Raichlen et al. 2020).

There's an even more important reason to get out of those chairs. Remaining sedentary also promotes weight gain and obesity-related morbidity beyond what can be explained by a calorie surplus (Buckley et al. 2015). Alternatively, intermittent light exercise throughout the day results in weight loss, reduced general inflammation, and less joint and lower back pain. Preliminary research points to a reduction in stress hormones and inflammatory cytokines as key mediators of these improvements. One study even found that subjects who engaged in short walks periodically throughout the day enjoyed greater health benefits than disciplined joggers who are otherwise physically idle throughout their work day. For this reason, public health scientists are moving away from the word *exercise*—which is seen as daunting—and instead urge people to engage in frequent *movement*. Just getting up and walking around for a few minutes every hour may be better for us than running a couple miles at the end of the workday.

There is yet another context in which the sitting posture is not optimal: defecation. Outside of the West, sitting on a commode is not universal, and most people squat above a hole in the ground during bowel movements. Greater hip flexion relaxes the puborectalis muscle and straightens the rectal canal, making defecation easier (Sakakibara et al. 2010). For this reason, squatting during elimination can reduce constipation and abdominal pressure, which can ameliorate hernias and hemorrhoids. Straining during defecation is especially dangerous for those with congestive heart failure, as the increased thoracic pressure can trigger a heart attack. The realization that squatting is better for defecation has inspired bathroom products that facilitate this posture while using a standard seated toilet and their utility has been confirmed in clinical studies.

Oral Health

Another unfortunate consequence of our switch to cultivated foods is a deterioration of our oral health. Before the age of toothpaste and root canals, the state of oral hygiene was pretty bleak. But long before that, the fossil record indicates that oral health was better *before* the dawn of agriculture than after. Oral caries (cavities) were not common among our pre-agrarian ancestors but became rampant around the time that foraging peoples transitioned to farming (Tayles et al. 2000). This, too, is likely due to the introduction of sugar and the switch to a carbohydrate-rich diet. Dissolved sugars and carbohydrates form a sticky film on our teeth that feeds the bacterial flora in our mouths. The microbial biofilm hardens into plaque, which promotes gingivitis and tooth decay, both

very painful conditions.

Even earlier than that, the switch to cooked and soft domesticated fruits facilitated the teeth crowding that so many of us now experience, especially when the third molars descend in late adolescence. This is because for many millions of years, apes and hominins have lived on fibrous leaves, gritty fruits, hard roots and nuts, and tough raw meat. This meant that our ancestors spent many hours each day chewing, which, during childhood, promotes the growth of the jaw bone, expanding the room available for teeth. In short, our ancestors had plenty of room in their mouths, which meant there was no need for orthodontics and teeth were easier to keep clean (Zink and Lieberman 2016).

One way we can reduce tooth decay is by chewing gum after meals. While dentists previously urged us to brush our teeth after we eat to wipe away the film of carbohydrates and bits of food that would otherwise feed bacteria, we now know that brushing *immediately* after eating actually weakens our tooth enamel. The rapid digestion of simple carbohydrates by microbes and our own salivary enzymes produces acid, which softens tooth enamel, making it vulnerable to abrasive toothpastes and brushing. Chewing gum after a meal not only removes the carbohydrate film and bits of food, it also stimulates saliva production, helping to wash away the sugar and the acid, raise the pH, and reharden tooth enamel prior to brushing. Brush after each meal, but chew gum for a little while first.

Mental Health

Evolutionary medicine may also inform our understanding of mental health. Given the near-epidemic rates of depression and anxiety, evolutionary thinking is poised to make a major impact. While there is (so far) very little we can apply to profound mental illness, an examination of the social aspects of the EEA may provide insights for more common behavioral health issues such as social anxiety, panic disorders, seasonal affective disorder, episodic depression, and even conditions such as obsessive-compulsive disorder, hoarding disorder, self-injury, eating disorders, and so on. These less severe but much more common forms of mental illness may be a direct result of how different our modern social environment is from the EEA.

For example, foragers live in a very close-knit society, where all members of the group are well acquainted and encountering strangers is nearly unheard of. Further, domiciles tend to be shared by multigenerational families living in close quarters with little or no privacy. This extensive social interconnectedness is in stark contrast to the segregated and isolated way in which many homes are structured. Notably, a common thread among many who struggle with mental health is a feeling of isolation. This may seem paradoxical given current states of population density, but it is social—not physical—isolation at issue. It is possible to live in a densely populated city without feeling connected to anyone.

Jared Diamond tells a story in which he was speaking with indigenous foragers about mental illness (Diamond 2013).

The tribe healer explained that, when someone is suffering from depression, the "prescription" is given to the person's friends or family to spend more time talking and engaging with them, and to bring them to rituals and social gatherings, even when they resist. While this form of treatment, on its own, may not easily translate to the current moment, it is firmly grounded in our socio-biology.

Our mood is largely mediated by the actions of neurotransmitters in our brains, principally serotonin and dopamine, and to a lesser extent norepinephrine, oxytocin, glutamate, and GABA. Pharmacological treatments for mental illness invariably target these neurotransmitters, especially serotonin. However, social interactions also affect these and can have a powerful effect on mood, an effect seen urgently during the lockdowns of 2020. It may very well be that the current mental health crisis is due to the mismatched social environment we've constructed.

Importantly, compared to our ancestors, modern populations are also overfed, sedentary, vitamin deficient, deprived of sleep and sunlight, and plagued by financial and work-related stress, which raises the stress hormones that wreak havoc with our metabolism. Each of these are aggravating factors for mental health, and the combination may be literally toxic to some people. Depression may indeed be a disease of modernization (Hidaka 2012).

It must also be said that our own instincts and urges often

undermine our health. Many of us crave big homes, ample space, plenty of privacy, easy commutes, fast-paced jobs, and modern conveniences. But cravings are not a reliable indicator of whether something is good for us, as the human sweet tooth makes abundantly clear. Just like good physical health requires us to resist the cravings for junk foods and relaxation, good mental health requires us to resist our temptation to close ourselves off from others. And just as some are more prone to gain weight on an unhealthy diet, some are more vulnerable to the mental health costs of social isolation, physical inactivity, or a stress-filled lifestyle.

Even worse, social media may contribute to social isolation, as the interactions it affords are too shallow to improve our mood but significant enough to make us *think* we are connecting with other people like we would in the real world. Here is yet another reason that social media did not lead to a better world, as we were promised.

Neurodiversity

Evolutionary thinking may also offer a new perspective on conditions such as attention-deficit/hyperactivity disorder (ADHD) and autism. The medical model insists that these are disorders that should be treated. While that may be true in some cases, it may also be that these "conditions" are actually just differences in how the brain works. The various ways that autism manifests are at odds with much of how our society is structured, but people with ADHD or autism often have certain abilities or tendencies in which they outperform most people with neurotypical development. Indeed, there is a natural range of sensory processing styles, personality types, and modes of executive functioning, and a large portion of autistic people themselves report a strong resistance to being "cured" and prefer being as they naturally are. This has led some to abandon the medical model and instead focus on creating communities of solidarity, support, and connection.

Given how different the social and sensory environment was in the EEA, we have no way of knowing how the suite of mental differences we call ADHD or autism might have actually presented among our ancestors. Further still, it stands to reason that having individuals with a range of mental aptitudes, sensory sensitivities, and modes of reasoning would have been beneficial for a group of people living in a state of nature. From elementary school to the office, we have built a streamlined society that fits only those in the typical range of attention, stillness, communication style, emotional engagement, and task management, with incentives and punishments doled out accordingly. Those who deviate from the expected neurotypical ideal are often excluded from various aspects of society and labeled as misfits if they cannot shoehorn themselves into conformity. But maybe it's the shoe that is the problem rather than the foot.

Although the field is still in its infancy, the hope offered by evolutionary medicine is that, by understanding the environments in which our ancestors evolved, we can gain a more complete view of how and why our organ systems function. With this more holistic perspective on health and disease, we can live in better harmony with our bodies and minds and live longer, healthier, happier lives. ■

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Weird Things Some Scientific Skeptics Say about Science

Scientific skeptics make claims about science, ranging from Occam's razor to Popperian falsification, that don't always hold up under closer scrutiny.

CHARLES G.M. PAXTON

Despite their commitment to critical thinking and evidence-based approaches to solving problems, some otherwise very clear-thinking skeptics occasionally promote some very odd views about the day-to-day practice of science that would come as a surprise to most scientists and philosophers of science.

Claim #1: Distinguishing between Science and Pseudoscience Is Easy

Some skeptics are quick to label pseudoscience with an alacrity that would surprise most philosophers of science who regard distinguishing between science and pseudoscience as a major problem. Philosophers even have a name for it: the demarcation problem. Some philosophers even claim it is not possible to distinguish between science and pseudoscience (e.g., Laudan 1983)—save perhaps in a fuzzy way. Obviously in some fields, pseudoscience is easier to identify when scientific-sounding claims are made with no evidence. Spurious claims have been made for centuries for the efficacy of strange treatments, unguents, and pills in the absence of evidence. Even today, there are homeopathic practitioners and even germ theory rejectionists claiming their beliefs rest on scientific evidence. However, such fields and claims are the low-lying fruit of pseudoscience.

In other fields, distinguishing between science and pseudoscience is far more difficult. Take, for example, cryptozoology and SETI (the Search for Extraterrestrial Intelligence). One might think cryptozoology (as its original definition given in Heuvelmans 1988), "The scientific study of hidden animals, i.e., of still unknown animal forms about which only testimonial and circumstantial evidence is available, or material evidence considered insufficient by some," is an obvious pseudoscience given many articles and books (e.g., "Cryptozoology" 2023; Loxton and Prothero 2013). Certainly, there are individuals engaging in pseudoscientific behavior (Hill 2017). Yet there *are* still newly discovered large animals (e.g., a new species of beaked whale [Yamada et al. 2019]). Peer reviewed science, identifying as cryptozoology, is found in mainstream science journals (e.g., Paxton 2009; Paxton 1998), which I hope skeptical colleagues would recognize as science! In addition, there are mainstream papers in zoology (e.g., Fitzpatrick et al. 2005; Hume et al. 2004; Solow and Roberts 2003; Boyd and Stanfield 1998) that follow similar methodologies as cryptozoology but do not identify as such. For this reason and others, the status of cryptozoology, for example, is rather more debatable and interesting than many skeptics realize (e.g., see discussions in Naish 2017; Paxton 2002; Roesch and Moore 2002) and provides a useful discipline for considering problems in critical thinking (e.g., Paxton et al. 2025).

In contrast, SETI has a more respectable status than cryptozoology, perhaps because SETI is distinct from UFOlogy in a way that cryptozoology is not distinct from interest in paranormal entities. Yet in its decades-long existence, SETI has not really discovered its target; therefore, it fails one criterion of science, namely progressionism (e.g. Laudan 1977), an accusation that could arguably also be made, albeit slightly more weakly, at cryptozoology. The probability of life arising on other worlds is subject to great uncertainty (Tramiel 2022), so we are far from knowing whether SETI will have any success.

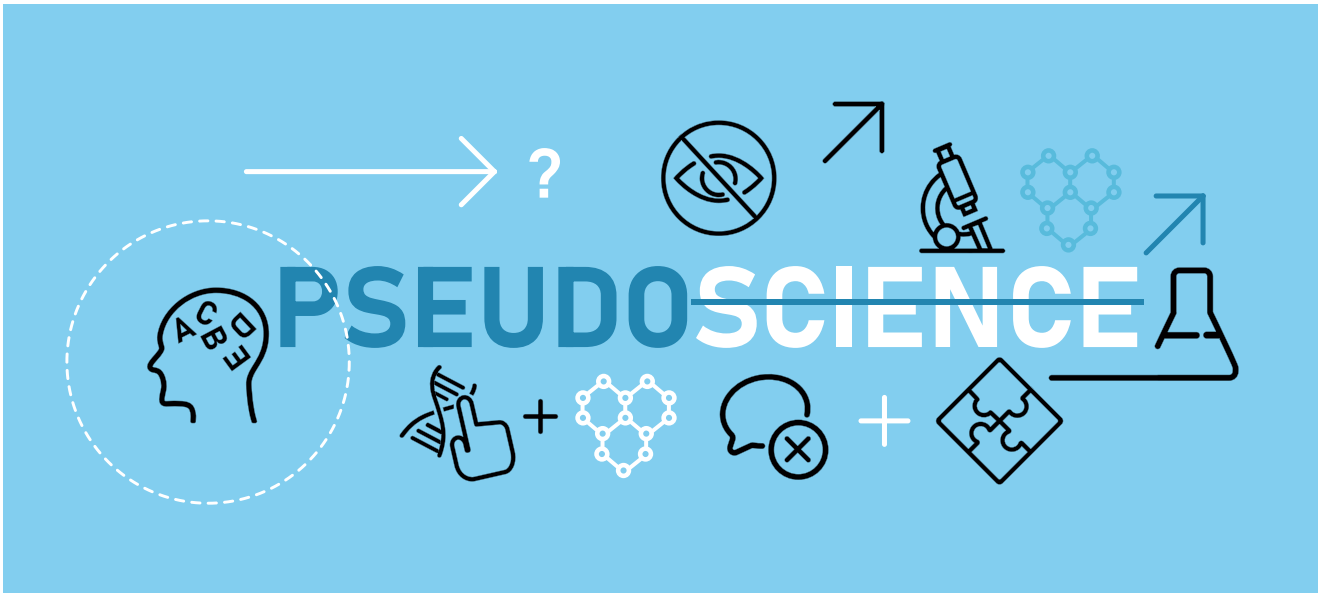
Claim #2: Popperian Falsification Is an Important Everyday Part of the Scientific Process

Karl Popper (1959) proposed, in an attempt to escape the problem of induction (and as a science and pseudoscience demarcation criterion, see above), that rather than hypotheses being confirmed, they can only be falsified (as this is definitive). This is, of course, partially true. Falsifiability is a most desirable property of hypotheses, and it is certainly a very useful check on any idea and extremely useful in everyday thinking.

However, there are problems with going further and suggesting, for example, that "Falsifiability … is only the minimum trait required of a claim that allows it to be engaged with in a scientific manner—a dividing line between what is considered science and what isn't" (Shuttleworth and Wilson 2008). Here's another example: "Falsifiability is one of the cornerstones of science" (Fallacy Man 2015).

If these statements are true, they beg two questions: How did science function prior to Popper publishing falsification as a criterion in the 1930s? And why are scientific papers not full of Popperian falsifications?

First, of course, scientists do a lot of other things other than test hypotheses, namely measure things, count things, and discover things. Many discoveries—for example of volcanoes on a Jovian moon (Morabito et al. 1979)—can arise without foreknowledge so are in no sense a test. Second, even when testing, scientists in practice often effectively seek confirmatory evidence of hypotheses rather than a falsification. A moment's reflection of the great moments of science where scientific hy-



potheses were accepted were by confirmation of predictions of the theory, not by falsifications (unless one perversely inverts the process by saying the nonexistence of a thing was disproven). Elementary particles such as the Higg's boson have been predicted and discovered, Edward Jenner showed vaccinations work, Ignaz Semmelweis's hygienic measures have decreased the rate of puerperal fever, James Watson and Francis Crick used an accumulation of evidence to argue for the double helix structure of DNA rather than disprove other theories, although one can argue some of the evidence they used did that too.

Even consideration of the day-to-day experience of scientists involved reveals a lack of strict Popperian falsification. Chemists develop a new method to synthesize a chemical, and biologists discover range extensions of animals and demonstrate animal, plant, and gene properties. Any number of interdisciplinary scientists look for evidence in favor of their hypotheses. They are not definitive Popperian falsifications but instead progressive confirmations and discoveries.

Confirmations can be definitive too. It would take but a single Bigfoot carcass to establish the existence of Bigfoot as an animal species. A strict Popperian falsification of Bigfoot would require a simultaneous search of all of continental North America at one moment.

All this is not to say there is not a role for falsification in science, but there are problems with it. By Popper's criterion, "the moon is made out of cheese" is a falsifiable scientific hypothesis, and "dinosaur fossils are found in the interior of Antarctica" currently is not, because the fossils are buried under kilometer-thick ice even though such a hypothesis is supported by the existence of dinosaur fossils in the accessible parts of Antarctica. Under a rigid Popperian falsification definition, such skeptical bugbears as creation science and even flat earth belief *can* pass as science because they make falsifiable hypotheses. It is just that their adherents refuse to accept the obvious falsifications. There are other issues with Popperian falsification associated with the role of alternative explanations and whether theories should be altered rather than wholly rejected when evidence against them is found.

It should be stressed that falsifiability is a most useful property of scientific hypotheses (and indeed theories), and skeptics should encourage scientists to create falsifiable hypotheses. It is also true that unfalsifiable hypotheses can be a characteristic of pseudoscience, but strict Popperian falsifiability is far from the be all and end all of science, ultimately because, contrary to Popper, science continues to use induction.

Claim #3: Good Science Must Produce Replicable Results

This is a minor issue, but some critical thinking promoters (e.g., Brunning 2014) talk of the importance of the reproducible results in science, often forgetting or not realizing vast vistas of science are not repeatable. Obviously for generalization, replicability is a most desirable property of scientific results, and the lack of replicability in some sciences is an issue (e.g., Open Science Collaboration 2015), but a lack of replicability of results is not necessarily an indicator of bad science.

Statisticians and scientists distinguish between *experiments* and *observational studies*. The former are manipulations carried out by the scientists, while the latter are where the scientist goes and observes without manipulation. It is obvious that observational studies, unless carried out at the same time and place, will not be exactly the same as previous studies. While chemical and physical experiments will have a high expectation of producing similar results, observational studies in ecology, for example, may not. Even where replicable experiments are performed, results may not be repeatable. For example, psychology experiments even using the same protocol may not produce the same answers in different groups of people, not because the science was flawed or a fluke result fails to be reproduced but because effectively a different population (perhaps in terms of age, ethnicity, etc.) was under consideration. In other cases, a lack of replicability is in the nature of the science. Finding a dinosaur specimen in a geological strata is no guarantee of finding the same species again. Astronomical events, such as strange emissions from far off galaxies, at least in the short term,

may not reoccur.

The lack of repeatability is not necessarily a problem, but it does mean that some studies will not have the wider generalizability some skeptics assume.

Claim #4: Merely Proposing a Hypothesis for Something Means the Question Is Solved

One important difference between most skeptical approaches to science and actual science is the difference in the approach to explanation. Skeptics often assert a reasonable sounding prosaic explanation for, for example, a report of an aquatic monster, UFO, or Bigfoot and then leave it at that, assuming the case has been solved. Now acceptance of the prosaic explanation is an obvious application of Occam's razor (but see below), especially with no further evidence. If skeptics used the methods of the humanities, the acceptance of such prosaic claims could be forgiven, because after all humanities scholars often produce compelling explanations for things and leave it at that. However, an explanation by itself is not good enough for a scientist; we like to test claims, and because the skeptical movement is a scientific movement (Kurtz 1992), claims should be tested.

Now, life is short, and as Benjamin Radford (2022) observed, skeptical experiments and observational studies could be expensive and/or logistically prohibitive. Therefore, it is perhaps understandable that obvious prosaic explanations are not always tested and indeed plenty of science does not involve testing hypotheses. Nevertheless, it remains an obvious chink in the armor of the skeptic, and there are examples where some ingenious skeptical explanations have proven wrong or at least not as extensively applicable as originally thought (e.g., infrasound as an explanation for hauntings [Dagnall et al. 2020]), and the costs of such tests can be low.

Therefore, producing a prosaic explanation for an unusual phenomenon does not explain a phenomenon away and should be seen as a first step in a scientific process of testing the hypothesis. *Scientific* skeptics should test their hypotheses more. If not, they themselves are open to accusations of pseudoscientific behavior!

Claim #5: Choosing between Hypotheses Is Solely about Using Occam's Razor

As noted, one argument for just accepting prosaic explanations for phenomena is Occam's razor. Occam's razor suggests accepting the simplest hypothesis over others. However, for such a rule to be usable by scientists, it needs another often forgotten component: the hypotheses must have equal explanatory power. Occam's razor is not a rule of thumb for choosing between hypotheses of unequal explanatory power, and scientists are often faced with this problem. The statistical solution to this conundrum is to use actual indices such as Akaike's Information criterion or adjusted R^2 when handling data that give a score that allows comparison between statistical models offsetting complexity and explanatory power. But how much should complexity offset explanatory power? Here is the problem: An enthusiastic cryptozoologist, for example, could fine-tune a monstrous explanation for the New England Sea Serpent seen by multiple witnesses from 1817–1821, which explained everything observed in every report with perhaps some sort of shape-shifting animal. My own preferred explanation for the New England Sea Serpent is that it has multiple prosaic explanations from debris to commonplace animals to out of place rare animals (perhaps narwhals, see Nickell 2019). But in what sense is my explanation or that of Elizabeth Fama (2012) and Robert France (2019), who both believe the New England Sea Serpent reports were generated by marine megafauna entrapped in human debris, less complicated than the cryptozoologists or indeed Joe Nickell's explanation, which has the simplicity of considering just one species?

Balancing explanatory power and parsimony for single events (as opposed to conclusions from datasets where statistics can be used) is also a really difficult problem. The best explanation of a single report of an anomaly must be a tradeoff in terms of parsimony, explanatory power, and generalizability.

Claim #6: Proper Science Uses Randomized Controlled Trials

As the above discussion shows, not all science is experimental, so by extension, not all science consists of experiments as seen in drug trials. This means that very popular well-meaning skeptical TikTok videos (Travelingnurse 2021) or websites that say real science involves randomized controlled trials (RCTs) or that RCTs are close to the evidential pinnacle of science are hugely overgeneralizing.

Further, not even within medicine are all evidence-based approaches based solely on RCTs, which can be flawed or not practicable (Greenhalgh et al. 2022). So, the pyramids of evidence seen over some skeptical websites are only relevant to some medical problems, not even to all medicine, let alone science more generally.

Claim #7: Sciences Are Not Interdisciplinary

The same TikTok video referenced above implies that scientists do not or should not comment outside their own discipline. Interdisciplinarity is commonplace in science with teams of scientists collaborating to achieve results. Some fields are almost exclusively interdisciplinary until someone invents a name for them as a unique new discipline. In my career, I have coauthored papers on geology and models of climate—neither of which I have any training in. Scientists can and do criticize scientific opinion beyond their own discipline (just, of course, as skeptics do!).

Claim #8: Science Should Not Use Anecdotes

I addressed the issue of anecdotes in science in detail in a previous article in Skeptical Inquirer (Paxton 2022). To be sure, anecdotes are not ideal evidence and can be unsystematic, biased, lead to unsubstantiated notions of causality, and be ultimately untrue. But they might not be, and this can make them useful to the scientific process. One problem is that the term *anecdote* covers several rather different things. Skeptics often mean by "anecdote" causal stories, especially in a medical context: "Taking snake oil cured my COVID." Such stories by themselves may have little value, save perhaps as a source of hypotheses, typically because of a lack of a control. However, other types of anecdotes

or "narratives of a detached incident," as the old definition in the *Oxford English Dictionary* had, can been used as data if brought together. Even single cases (perhaps also known as reporting symptoms or eyewitness testimony) can have evidential value (albeit potentially weak) because of biases. It would be a very bad doctor who dismissed a potential causal story for a condition from a patient as a "mere anecdote." Many countries have side effect reporting systems where what are effectively anecdotes are collected to see if when widely propagated drugs have adverse effects (e.g., Medicine and Healthcare Products Regulatory Agency n.d.). Finally, anecdotal reports may be the only way to try to understand some rare, unpredictable natural phenomena.

Discussion

Skeptics are the greatest advocates for evidence-based approaches to solving problems, but like all other humans they can overlook the obvious. Many of these strange skeptical beliefs about science are readily (ironically) falsifiable by even a moment's contemplation of the day-to-day practice of science, and yet they persist in the skeptical community.

Science is marvelously diverse, so prescriptively saying something from one field applies to all fields can be an inaccurate generalization. Thus, the above claims almost certainly won't be generalizable across all fields. I appreciate that for teaching purposes some generalization may be necessary as a first step. However, there is a danger that some people within the skeptical community will, ironically, treat these generalizations as catechism. While I would not go so far as the philosopher of science Paul Feyerabend (1975) in saying "anything goes" in science, there is always a risk that any methodological rule in science will be subverted in some usefully ingenious way. Anecdotes seem dodgy, but if considered carefully they are amenable to scientific use. For every obvious pseudoscience (homeopathy, flat earth, etc.), there are fields (e.g., cryptozoology in its Heuvelmans sense and SETI) whose status is more debatable. In every discipline, there will be scientists breaking the mold using unusual information in unusual ways. The rules of science can sometimes be constructively broken in a rational, critical, evidence-based manner that can be overlooked by scientific skeptics if they adhere too closely to a narrow sloganizing approach to what is and what is not science. ■

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FORUM]

Toxic Lies: Why Chemical, Biological, Radiological, and Nuclear Disinformation Matters

KATY CARROLL, MARIANA DÍAZ-GARCÍA, AND FRANCESCO MARELLI

What springs to mind when you hear about chemical, biological, radiological, or nuclear emergencies? Perhaps recent memories of the COVID-19 pandemic are your first thoughts. For many, it's the Chernobyl disaster of 1986, when a nuclear power reactor exploded and released large quantities of radiation. Maybe you ran through a list of popular books and films: *The Andromeda Strain*, *I Am Legend*, *Contagion*, *Dark Waters*, or *White Noise*.

It's no coincidence that literature and cinema frequently depict apocalyptic scenarios featuring evil characters orchestrating biological disasters, chemical attacks, and nuclear devastation. Emergencies involving chemical, biological, radiological, and nuclear (CBRN) materials are especially quick to capture our collective imagination. Despite their many differences, these materials are often grouped together because of four key shared characteristics: toxicity, latency, persistency, and transmissibility (International Committee of the Red Cross 2014). They influence how the CBRN community responds to any potential crisis involving these substances.

But who and what makes up the CBRN community? No universal definition exists, but it's a network of agencies and people who prevent and respond to events such as the accidental release of chemical materials, pandemics, nuclear disasters, or bioterrorism.

This community includes specialized government agencies (such as fire brigades, hazmat teams, civil protection, and law enforcement), diplomats and policymakers working to ensure compliance with nonproliferation treaties and safety standards, scientific researchers studying epidemics, military and intelligence sectors focused on CBRN threats, companies developing technology solutions for detection and decontamination, and international organizations supporting countries in these efforts.

One of these international organizations is the United Nations, and its key actor in this field is the United Nations Interregional Crime and Justice Research Institute (UNICRI). A specialized research and training institution, UNICRI has been monitoring and analyzing CBRN disinformation since 2020 to understand its impact on public trust, security, and governance. Together with the rest of the CBRN community, UNICRI works to enhance safety, security, and resilience against CBRN-related risks.

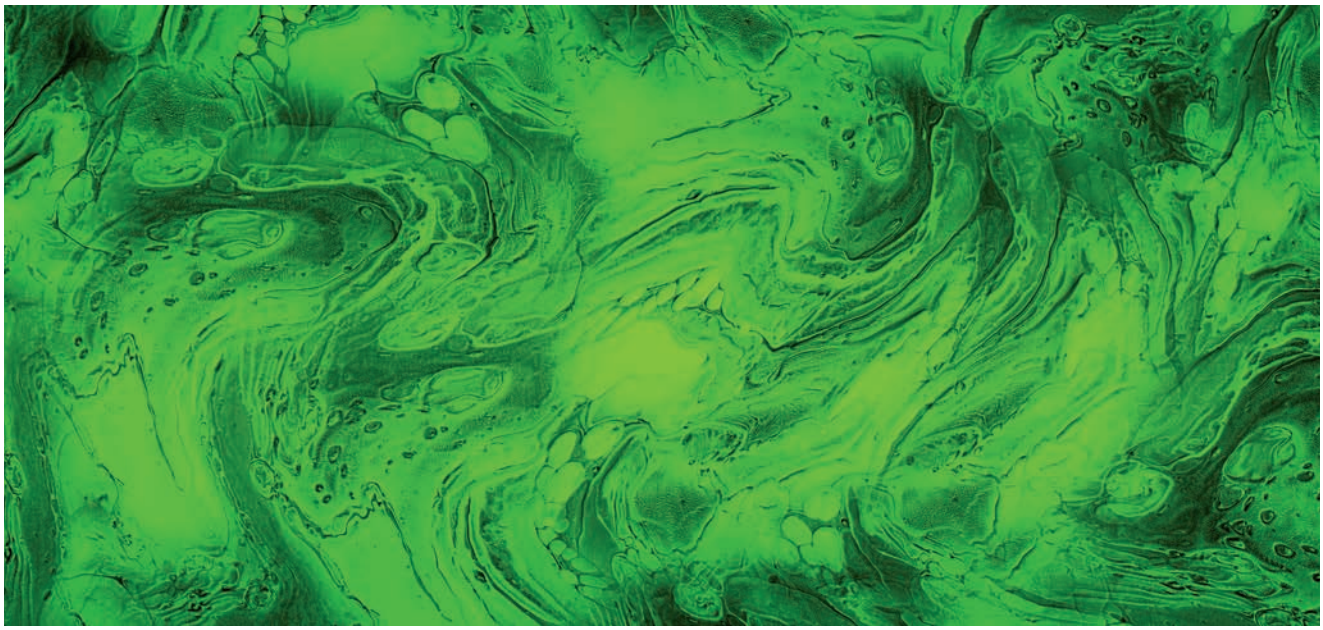
However, our work is now being made more difficult by a complex threat—and no, it's not a terrifying new virus or a potential nuclear apocalypse. CBRN disinformation is intentionally misleading, providing deceptive information about chemical, biological, radiological, or nuclear threats. This disinformation can potentially cause serious political, financial, and physical harm to governments, international organizations, the scientific community, academia, industry, and the population at large.

CBRN materials provide fertile ground for sowing false narratives. There is a relatively high public awareness of CBRN materials (perhaps due to their frequent use as Hollywood fodder) but comparatively little understanding of how they behave. Truly understanding CBRN threats requires advanced technical knowledge in areas such as radiation contamination, viral infection, or inhibition of chemical toxicity. Without the knowledge and expertise needed to critically analyze news or opinions on these topics, it's difficult to distinguish between truth and lies.

CBRN materials have the potential to cause significant harm and, for this reason, are integral parts of many weapons of mass destruction. Worse still, they are often intangible: an invisible, unknown, and very dangerous substance naturally evokes a sense of dread. Added to this potent cocktail are strong emotions such as fear and panic, which tend to inhibit a person's reasoning, making them an excellent topic for spreading disinformation.

While CBRN materials have been used as a vehicle to spread false information for decades, the community has only recently started to perceive them as a significant threat. But why? What makes the current landscape different?

We believe that the development of social media platforms has played an essential role. In the past, disinformation spread at a relatively slow pace through traditional channels such as newspapers, television, or word of mouth. Today, however, social media and other digital platforms have changed the rules of the game, enabling the rapid and global distribution of false narratives and conspiracy theories. While it was previously



possible to mitigate disinformation and its distribution, social media has made it much more difficult for experts to do so. Anyone can easily produce manipulative messages or videos to post online. Social media algorithms—designed to target users with the content most appealing to them—amplify the reach of this disinformation, pushing it toward sympathetic ears.

Uncontrolled CBRN disinformation, conspiracy theories, and misinformation at such scale can impact the safety of the general public. In one case, a misleading video circulated online falsely claimed that the U.S. government had issued an alert about an imminent nuclear attack (Townend 2024); in reality, the footage was taken from an emergency drill. However, its out-of-context presentation caused panic and confusion among the public, highlighting how easily CBRN-related false information can undermine trust in official warning systems. Another video, supposedly showing the BBC interrupting its programming to alert the United Kingdom to a nuclear attack, was also recently debunked (Krishna 2020).

Similarly, another wave of disinformation falsely suggested that U.S. government officials had warned residents to prepare for a biological attack coinciding with the April 8, 2024, solar eclipse (Thompson 2024). This baseless claim—spread via social media—risked eroding public confidence in government communications and could have led to misallocation of emergency resources or public overreaction. These examples show how CBRN disinformation not only creates fear and uncertainty but also disrupts official response mechanisms during critical incidents, putting everyone's safety at risk.

But misinformation and disinformation also pose a direct, real-world threat to the CBRN community itself. For example, during the COVID-19 pandemic, false information about vaccines and public health measures led to multiple incidents of harassment and violence against scientists and health officials (see Lawless 2024 and "Harassment of Public Health Officials" 2022) and likely played a role in the August 2025 shooting at the CDC headquarters in Atlanta.

In March 2022, Christoph Berger—then-president of the Federal Vaccination Commission and a prominent coronavirus pundit on Swiss television—was even briefly kidnapped by someone demanding a substantial ransom. (This individual also believed in conspiracy theories about flat earth, chemtrails, and the surveillance state.)

CBRN disinformation has also put the United Nations in the line of fire, with violent far-right extremist groups falsely attributing the origin of COVID-19 to the organization. One conspiracy linked the virus to Agenda 21, an environmental action plan adopted by 178 governments at a United Nations conference held in Brazil in the early 1990s. Without evidence, extremists wrongly insisted that COVID-19 was instrumental to the plan's real objective to reduce the world population to under 500 million.

So, how has the CBRN community reacted to all these attacks?

It has largely been, and still is, unprepared. The CBRN community actively engages in discussions about risks and solutions, but these conversations mostly take place in scientific journals and at international conferences using inaccessible technical language. In contrast, CBRN disinformation being spread online uses simple, emotionally charged language, making it both more persuasive and pervasive.

We believe the main problem is that many agencies don't have a clear strategy to combat CBRN disinformation. While CBRN professionals have the technical knowledge to identify false narratives, they are not trained in media engagement or in countering disinformation tactics. As a result, their responses may be scientifically sound but often fail to match the emotional impact of disinformation.

Many CBRN agencies also lack dedicated spokespeople or communication departments to engage with the public directly, allowing false narratives to spread unchecked and potentially become viral. And when official statements are finally released, they are often unaligned with other agen-

cies, reducing their effectiveness. With limited resources and communication teams already under strain, these agencies are ill-equipped to deal with the next threat: AI-generated disinformation. Deepfake videos or fabricated reports peddling CBRN disinformation will only make things more difficult to manage in the future.

To try and address this, CBRN agencies have begun dedicating more time to providing reliable public information on social media platforms and their websites. However, these efforts often still use complex language, which limits the engagement needed to counter the rapid and viral spread of CBRN disinformation.

In some cases, governments and major tech companies have relied on fact-checking organizations to combat CBRN disinformation, particularly during the COVID-19 pandemic. While these companies provide high-quality services, there are limitations to this approach. One challenge is financial sustainability, which remains critical for both fact-checking initiatives and technology-driven solutions. Fact-checking groups have also faced accusations of political or ideological bias, leading to distrust among certain segments of the public.

Special attention has also been given to technology that can detect and debunk disinformation on social media, and AI in particular. For example, algorithms can rapidly assess the trustworthiness of news, generating a credibility score based on journalistic standards. These include the media outlet's history, the author's expertise and political leanings, the sources cited in the article, and the piece's bias (partial/impartial).

While technology is a useful tool, it's not a standalone solution. It can certainly help to counter CBRN disinformation by increasing speed and scalability when analyzing data, identifying trends, and detecting suspicious content. But, for now, the human ability to critically evaluate information remains irreplaceable. Technology also introduces new challenges, including ethical concerns and economic considerations. Who develops and owns these algorithms? Is the technology accessible and affordable to everyone everywhere?

It's clear that improving just a single approach—whether communication, technology, or fact-checking—will not fully address the problem. So, where do we go from here? What's the answer to this complex problem?

We believe that the solution does not lie with technology, fact-checking companies, or the CBRN community; it requires a strategic alliance among them. Policymakers, emergency responders, and scientists need to partner with journalists, academia, social media experts, and technology companies that have the skills and resources to combat disinformation.

However, this is a long process, and it will require several steps to establish sustainable coordination mechanisms. For example, governments may need to create national bodies that would bring together all the agencies involved in countering CBRN disinformation. These task forces would develop and implement procedures to respond to major CBRN-related disinformation campaigns.

Additionally, with the support of United Nations agencies such as UNICRI, governments could collaborate with fact-checking organizations, local influencers, social media platforms, media outlets, and academic institutions. These actors would not only help to push counter-disinformation messages but, more importantly, make communication strategies more targeted. CBRN disinformation narratives are often tailored to specific countries and cultural contexts, meaning that debunking strategies must also be localized. Even if messaging is developed globally, it has to resonate with individual audiences to maximize its impact.

Any effective CBRN disinformation strategy needs to build public resilience through media and science literacy, particularly among young people. Again, this would require strategic alliances between educators, community leaders, champions from government, and international organizations.

The challenge for the CBRN community is significant. CBRN disasters—both real and the fictional ones created in Hollywood—have long captured the public's imagination. But today, the biggest danger may not be what is on the silver screen but rather the unchecked flood of CBRN disinformation on smaller screens. As a well-known song reminds us: "You better start swimmin' or you'll sink like a stone / For the times they are a-changin'."■

Note

The opinions, findings, conclusions, and recommendations expressed in this paper are solely those of the authors and do not necessarily reflect the views or positions of the United Nations.

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Katy Carroll is a fellow at UNICRI, where she contributes to initiatives at the intersection of nonproliferation, strategic communications, and international security.

Mariana Díaz-García works as associate programme officer at UNICRI, with her research over the past years focusing on disinformation and communication.

Francesco Marelli is the head of unit at UNICRI and coordinates a team of thirty experts that assists United Nations Member States to anticipate, assess, and mitigate CBRN threats.

Comment on Combatting CBRN Disinformation

AMARDEO SARMA

The article in this issue about disinformation raises a crucial issue: the spread of disinformation and the associated impact on public safety, especially around chemical, biological, radiological, and nuclear threats (see "Toxic Lies: Why Chemical, Biological, Radiological, and Nuclear [CBRN] Disinformation Matters" by Katy Carroll, Mariana Diaz-Garcia, and Francesco Marelli). It rightly points out that improving media and science literacy—especially among young people—is essential. The call for strategic alliances between educators, governments, and international organizations is well-intentioned.

The proposed solution would be strengthened by clarifications and a more concrete plan. Simply bringing together competent institutions doesn't guarantee public trust—especially when trust itself is one of the core problems. Would all these actors agree on what counts as disinformation? And, more importantly, would the public believe them?

In my view, three elements are essential for real progress:

1. Empowering individuals to think critically—to question claims, recognize their own biases, and understand that being wrong is part of learning. As Carl Sagan emphasized, skepticism is a vital tool for navigating complex information.
2. Establishing a truly neutral source of information—one that is transparent, nonpartisan, and is not seen to be driven by partisan goals. Without this, even the best alliances risk being dismissed as just another "side."
3. Acknowledging uncertainty openly—even seemingly fringe claims need to acknowledge uncertainty until we know better. Dismissing them outright at the start can backfire if later evidence supports them, further eroding public trust.

Ultimately, combating disinformation isn't just about better messaging; it's about earning trust, fostering independent thinking, and being honest about what we do and don't know.

Katy Carroll, Mariana Díaz-García, and Francesco Marelli Respond

We would like to thank Amardeo Sarma for his thoughtful engagement with our article and acknowledge that his comments highlight important concerns around trust, neutrality, and uncertainty. We wholly agree that bringing together competent institutions is just the first step of a cohesive strategy to counter CBRN disinformation. Through our training and interactions with government agencies, we promote media literacy, encourage dialogue, and highlight the importance of earning the public's trust. The ultimate goal is to achieve collaborative credibility, where diverse governmental and civil society actors mutually reinforce each other's transparency and accountability.

Amardeo Sarma is a fellow and member of the Executive Council of the Committee for Skeptical Inquiry. He is founder and past chairman of the German skeptics organization GWUP. He has been involved in industrial research for more than thirty-five years and is currently general manager at NEC Research Laboratories Europe in Germany.

FUN & GAMES

Edited by Stephen Hupp

YOU CAN FIND THE ANSWERS TO THESE GAMES IN SECRETS REVEALED (P. 66).

SILLY SORTING

This list includes some episode titles of the show *Stranger Things* and some works written by Edgar Allan Poe. Can you tell which is which? Circle your guesses below.

ST SONNET TO SCIENCE

ST THE ANGEL OF THE ODD

ST THE BLACK CAT

ST THE BODY

ST THE HAUNTED PALACE

ST THE MONSTER

ST THE WEIRDO ON MAPLE STREET

SKEPTICROSS

1	2	3
2		
3		

ACROSS

1. It might help you see me
2. With 2 DOWN, the first two words of a magical movie trilogy
3. What you should give the Devil

DOWN

1. The last word in many movies
2. See 2 ACROSS
3. Sheepish homonym for 2 DOWN

Find 3 groups of 3 connections...

BRAIN	BRICK ROAD	BROOM
BUBBLE	CITY	COURAGE
HEART	MONKEY	SLIPPERS

Clue

CONNECTIVITY

These words can be divided into 3 groups, each with 3 words. Your brain is great at finding patterns—sometimes this helps, but other times it hurts!

Write your guesses here ➔

A Primer on the Placebo Effect's Evil Twin

William Matthew London

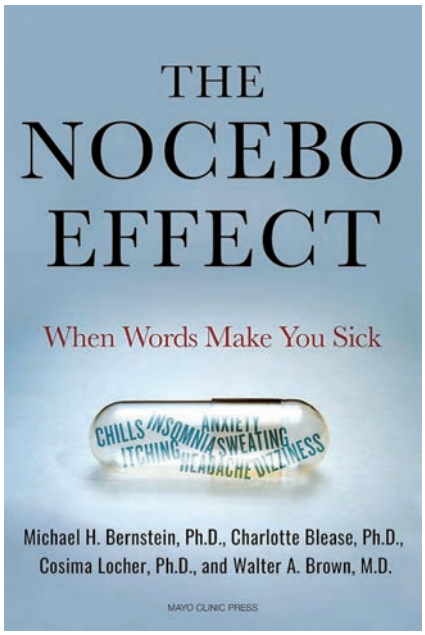
Editors Michael H. Bernstein, Charlotte Blease, Cosima Locher, and Walter A. Brown have put together a concise but wide-ranging overview of the nocebo effect. I recommend their book for both scholarly and general audiences. In the introduction, they explain that it is difficult to define the *nocebo effect*. They offer this "summary":

> "The occurrence of a harmful event that stems from consciously or subconsciously expecting it." The core of the nocebo effect is that adverse health effects occur as a result of negative *expectations* … The nocebo effect, then can be thought of as the scientific term for saying that when you expect to feel sick, you are more likely to feel sick. (p. 3)

They note that the term *nocebo* was coined by Walter Kennedy in 1961, stemming from the Latin *nocere*, which roughly translates as "to harm." Thus, the nocebo effect has been called the evil twin of the desirable (and better-known) placebo effect.

They describe what seems to be an example of the nocebo effect that was found during an investigation of eighteenth-century German physician Franz Mesmer's claim "that illnesses could be alleviated by using magnets to govern the flow of fluid in people's bodies." A commission established by King Louis XVI of France and led by Benjamin Franklin conducted studies using sham magnetism as a control condition. It reported that a patient who was misled to believe she was magnetized began after a minute to experience "shivering, [convulsing], with chattering of her teeth, twisting of her arms and trembling of the whole body" (p. 5, from the commission's report). The commission attributed the reactions to her "imagination."

The book is organized into four parts, each consisting of three chapters. Part One addresses "The Nocebo Effect and Your Health." Stephanie H. Meuwis and Andrea W.M. Evers explain that side effects of taking prescribed medications may in part be attributable to nocebo effects. For example, finasteride taken for prostate gland enlargement can reduce sexual functioning and libido, but some patients may experience those problems due to nocebo responses that may lead them to stop taking the medication. And children with rheumatism have been known to experience anticipatory nausea when seeing reminders of their prescribed methotrexate.



The Nocebo Effect: When Words Make You Sick. Edited by Michael H. Bernstein, Charlotte Blease, Cosima Locher, and Walter A. Brown. Mayo Clinic Press, 2024.

According to Cosima Locher and Helen Koechlin, there hasn't been much research on nocebo effects from psychotherapies. It is challenging to disentangle nocebo influences from other causes of negative psychotherapy outcomes. They assert that people in wait-list control groups in psychotherapy studies often have a worsening of symptoms that might reflect some nocebo influence. They also suggest that when psychotherapists use words that don't convey acceptance and understanding of their situation, their patients may lose hope and thus feel worse.

Kate MacGrill discusses evidence that COVID-19 vaccine hesitancy predicts greater vaccine side effects. Moreover, pressure to be vaccinated can increase side effects once people are vaccinated. She criticizes the media for overemphasizing rare but serious side effects. That can produce worry, she argues, and thereby exacerbate side effects such as chest pain and shortness of breath that are common in the general population. In New Zealand, media attention to myocarditis following vaccination was more strongly linked to patients reporting myocarditis symptoms than to patients reporting other side effects that did not receive as much media attention. She suggests that it's important to inform people that when they notice symptoms following vaccination, it's a sign of the vaccine working. She also notes that belief in having been infected is linked to symptoms—irrespective of clinical COVID-19 test results.

Part Two addresses "How the Nocebo Effect Works," offering philosophical, biological, and psychological perspectives.

Charlotte Blease argues that some health outcomes may reflect the natural history of one's illness or changes in behavior (or tendency to report symptoms to investigators) rather than negative expectations for treatments. When people misattribute symptoms to gluten, based on publicity about gluten sensitivity, should it be labeled a nocebo response? She questions whether psychological stress-induced cardiac deaths should be described as nocebo responses.

According to Luana Colloca, Maxie

Blasini, and Giordana Segneri, nocebo effects are linked to the release of the hormone cholecystokinin, which is associated with increased anxiety. They highlight pain, itchiness, and shortness of breath as possible nocebo effects. They give several fascinating examples of other nocebo effects. Among them is narrowing of airways in people with asthma who were given a bronchodilator they were told was a bronchoconstrictor.

John M. Kelly discusses our proneness to illusions. He distinguishes *symptom amplification misattribution* from *symptom misattribution*. In the former, patients experience symptoms due to medication, but they experience them as more severe or distressing due to increased focus on possible side effects. In the latter, patients experience symptoms they mistakenly think were caused by a medical treatment. He cites a systematic review published in 2014 that concluded: "Only a small minority of symptoms reported on statins [drugs that lower serum cholesterol] are genuinely due to the statins: almost all would occur just as frequently on placebo" (p. 93).

Part Three addresses "What to Do About the Nocebo Effect." Marco Annoni attempts to resolve the ethical dilemma of the duty to tell patients, out of respect for their autonomy, the truth, including possible treatment risks versus the duty to avoid minimizing harm caused by nocebo effects arising out of ensuring that patients give informed consent. He explores three strategies: (1) concealment authorized by patients; (2) access to electronic medical records; and (3) patient education about the nocebo effect.

Mette Sieg and Lene Vase provide details on how authorized concealment can work, how nocebo education can optimize patients' favorable expectations, and how patient-clinician interactions can be optimized. Wayne Jonas and Steve Bierman offer tips to patients so they can protect themselves from nocebo effects. The best part of their chapter was their discussion of caregivers miscommunicating to individual patients information about probabilities of health harms that was derived from studies of groups.

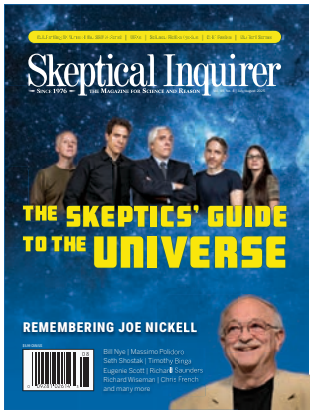
Part Four addresses "The Bigger Picture," in which Jerry T. Porsius explores how fear of what people consider to be toxic exposures (such as electromagnetic fields from mobile phones and power lines) may produce symptoms even without actual exposure. He argues that people react strongly to involuntary exposures, so it's important to work toward limiting feelings of injustice, lack of trust in authorities, and sense of outrage.

Kate MacGrill reviews examples of media coverage influencing actual symptoms and not just reporting of symptoms. She describes lab experiments in which seeing others experiencing side effects lead to people reporting similar symptoms. She calls for media to use less emotive language in reporting, avoid clickbait headlines, and avoid false balance about claims of risk.

Robert E. Bartholomew (a CSI fellow) discusses nocebo involvements in illness outbreaks. Examples include the culture-specific syndrome of koro in which people perceive their genitalia are shrinking or retracting into the body, illnesses of people living near a zoo giraffe enclosure after scientists learned that giraffes communicate with infrasound from ossicones on their heads, people attributing their own illnesses to the sounds of glass armonica playing after two players of the instrument in the 1700s became ill, and so-called Havana syndrome (see the September/October 2023 issue of Skeptical Inquirer).

In their conclusion, the editors call attention to the need for education on the nocebo effect in medical education and more empirical study data on how to manage the nocebo effect in clinical practice. ■

William Matthew London is the editor of *Consumer Health Digest*, the free weekly e-newsletter of the Center for Inquiry's Quackwatch, and an emeritus professor in the Department of Public Health at Cal State Los Angeles.



Joe Nickell Tribute

I would like to contribute to the remembrance of Joe Nickell by recalling a moment from 1994, when I gave a lecture at the National Museum of Natural Sciences in Madrid titled "From the Shroud of Turin to Uri Geller: A Tribute to *The Skeptical Inquirer*." The program note read:

"A tribute to the 19 years of *The Skeptical Inquirer* and its ongoing efforts to defend rational (empirical and experimental) knowledge against pseudo-knowledge such as Astrology, Alternative Medicine, UFO phenomena, the case of the Shroud of Turin, Paranormal powers, and much more. In a time of growing credulity, it is essential to reclaim critical thinking and adopt as a personal motto the principle that 'extraordinary claims require extraordinary evidence.'"

Although I was a complete stranger to Joe, I wrote to him asking for a slide of the Shroud image he had recreated, as described in his book *Inquest on the Shroud of Turin*. Joe kindly sent me the slide—mentioning that it was, in fact, the last one he had. This brief memory is just a small example of his generosity and of his lifelong dedication to sharing knowledge and promoting skepticism. He will be remembered with deep respect.

Antonio G. Valdecasas
Senior Researcher
Madrid, Spain

Being so fond of Joe Nickell and his writing, I read through all the many tributes in the July/August 2025 issue of Skeptical Inquirer, and only one mentioned directly his kindness (although several hinted at it). I wrote to him a few years ago saying that I especially appreciated that he (like Benjamin Radford) was always kind to those whose beliefs he was refuting. I shared his interests and enthusiasms and had a maybe naive question about the Shroud of Turin. Despite his caring for a loved one with dementia (as I was), he sent me a beautiful, kind letter, in long hand, by snail mail. His kindness should not be overlooked.

Nigel Bark
Hartsdale, New York

'Chemtrails'

In his column from the July/August 2025 issue, Mick West states that chemtrails are not a thing. After daily monitoring of our skies since they were first noticed here in 2016, I can debunk his contrail explanation. Two photos of the sky taken at the same time, an eastern view and western view from the same location, distinctly show a contrail from a jet on its way to our only regional airport, and the numerous cross-hatched "chemtrails" in the opposite direction over rural farmland—nowhere near an airport. The remaining sky was clear blue. "Chemtrail"-like stripes, by all accounts, have never appeared here in former decades when we played outdoors all summer and watched the sky. Another interesting finding based on daily recording and documentation of the "stripes," about 95 percent of the spraying activity occurs a day or two before forecasted precipitation. (The spraying does not appear consistent with the solar radiation reflection theory, because the resulting white haze does not correlate with surface temperatures throughout the seasons.)

Everyone we speak with now, from forecasters to government officials, acknowledges that stratospheric aerosol injection is happening and visible, which makes us wonder if the author may have an ulterior agenda that requires perpetuating his outdated explanation.

Rayne Schirm
Medina, Ohio

Mick West responds:

Most persistent contrails do not form behind planes near their origin or destination airports. This is because contrails need very cold temperatures, hence high altitude, to form, and descending or climbing jets are too low and in too-warm air. Instead, persistent contrails are much more likely to form in the cruise portion of the flight, when the jet is 30,000 feet or above.

Persistent contrails have been extensively documented in the 2000s, 1990s, and previous decades. Some locations have seen an increase due to the expansion of air routes. But if you look at old books on clouds (https://www.youtube.com/watch?v=X72uACIN_00) or online collections of contrail photos (https://www.metabunk.org/threads/contrails.487/), you will find many examples.

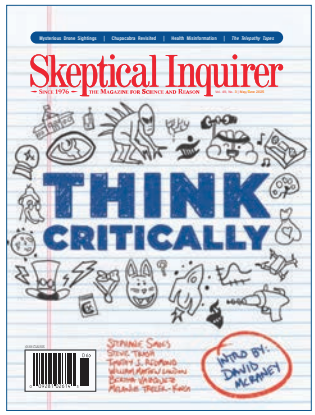
Contrails often predict the weather because they are a type of cirrus cloud. With an advancing warm front, the upper air moves faster, so you first see icy clouds, such as cirrus, then cirrostratus, altostratus, and finally nimbostratus (rain clouds).

Forecasters and government officials, with the exception of a few conspiracy-minded people, do not acknowledge that stratospheric aerosol injection is happening and visible. In fact, Trump-appointed EPA Director Lee Zeldin recently published online resources that specifically say that contrails are normal and not used for geoengineering and that no large-scale geoengineering has been done. See https://www.epa.gov/geoengineering and https://www.epa.gov/regulations-emissions-vehicles-and-engines/Contrails.

Fear of Flying (Correction)

I'm writing to tell you about an error I just spotted in the article "Fear of Flying and the Search for Gate 13" in the July/August 2025 issue. The author cites Paul Bogard: "In 2019 he was flying out of Portland, Oregon (PWM), when he noticed that there were Gates 1–12 and Gate 14 but no Gate 13." In fact, the airport code for Portland, *Oregon*, is PDX. PWM refers to the Portland International Jetport in Portland, *Maine*. We in Portland, Oregon, apparently experience less triskaidekaphobia than some other locations, as Concourses C and D in PDX both sport a Gate 13 (for an image, see https://airportguide.com/airport/info/PDX#maps). Just thought you'd like to know.

Karl Wiegers
Happy Valley, Oregon



Cancer Misinformation

I am a six-year cancer survivor who went through conventional cancer treatments, including chemotherapy. I read Andrea Love's article "Cancer Misinformation Kills" (May/June 2025). Although I'm not an immunologist, I did a lot of research to make the best choices and to know what may lie ahead.

I agree with Love about the need for conventional chemotherapy treatments. However, I have an issue with Love's dismissing *organic foods* as being any better than those treated with pesticides. I acknowledge that science has found that the residues of

pesticides on produce don't cause harm to people when ingested. However, scientists have found that those same pesticides affect invertebrates on land, in the air, and in the water.

Scientists have been raising the alarm for decades about these issues, the decline of invertebrates (birds, amphibians, and mammals too) worldwide. The decline appears to be caused by loss of habitat, pesticides, and climate change. Therefore, although pesticides may not harm humans directly when consumed (although farm workers are harmed directly), they harm us indirectly because the loss of invertebrates (pollinators, microbes in the soil, fish, amphibians, birds, and mammals) leads to a loss of food that we all eat. Organic foods (treated only when needed and with the least toxic matter) may be better than conventional foods that have been treated with pesticides after all.

Donna Russell
Roscommon, Michigan

Andrea Love responds:

I'd like to thank Donna Russell for sending in a comment. Beliefs about organic foods are based on a thirty-five-year marketing campaign where the public has been misled to believe that organic foods are grown without pesticides, whereas conventional foods are grown with pesticides. The reality is that both are grown with pesticides; otherwise, farmers would not be able to protect crops from destruction by fungi, bacteria, insects, and weeds. Organic farming uses pesticides that are derived from natural chemicals, but that does not mean they are inherently better for the environment, the ecosystems, and overall health. In fact, many pesticides used in organic farming are more toxic to more species and must be used at higher concentrations for effectiveness. For example, copper hydroxide is used in organic farming to control fungal infections and, with an LD50 of 1,000 mg/kg, is nine times more toxic than a conventional fungicide such as Captan (N-trichloromethylthio-4-cyclohexane-1,2-dicarboximide). Similarly, when assessing insecticides used to control aphids, it was determined that the methods used in organic farming were not only less effective but also killed the natural predators of aphids, the insidious flower bug and the multicolored Asian lady beetle (see https://doi.org/10.1371/journal.pone.0011250). Further, novel farming tools such as genetically engineered crops (which are prohibited in organic farming) enable farmers to reduce pesticide use. I absolutely agree that ecological impact should be a concern for all of us because our health depends on the health of all species on our planet. But the reality is that organic farming practices are not superior for nutrition of the foods or ecological impact, and promoting them may actually be causing far more harm.

Send in a Letter to the Editor

Letters to the Editor are for views on matters raised in recent issues. Letters should be no more than 225 words. Due to high volume, not all letters can be published, and those selected may be edited for space and clarity. Authors criticized may be given the opportunity to respond. Submit Letters to the Editor by email text (not attachment) to letters@skepticalinquirer.org. In the subject line, write "Letter to the Editor." Include your name and location (City, State).

SECRETS REVEALED

Skepticross Answer

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2 N	O	W
3 D	U	E

Connectivity Answer

Group #1: BRAIN, COURAGE, and HEART all represent the wishes of Dorothy's friends in Oz.

Group #2: BRICK ROAD, CITY, and SLIPPERS all connect to vibrant colors in Oz (i.e., yellow, emerald, and red).

Group #3: BROOM, BUBBLE, and MONKEY all defy gravity in Oz.

Silly Sorting Answer

Sonnet to Science = Poe poem
The Angel of the Odd = Poe story
The Balloon Hoax = Poe story
The Black Cat = Poe story
The Body = *Stranger Things* episode
The Haunted Palace = Poe poem
The Monster = *Stranger Things* episode
The Weirdo on Maple Street = *Stranger Things* episode

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